RCEME TECHNICAL BULLETIN

ANNEX "F"

M.61

ARMY TRADE SPECIFICATION

MASTER VEHICLE TECHNICIAN GROUP 4

1. GENERAL INFORMATION

1.1 Classification

1.1.1 Full Title	Abbreviation	Code Number
Master Vehicle Technician	Mr Veh Techn	Group 4 7784

1.2 Selection Requirements

1.2.1 Candidates must be members of The Corps of Royal Canadian Electrical and Mechanical Engineers or be willing to, and acceptable for, transfer to that corps.

1.2.2 Minimum "M" score and educational level: 150 and Grade 10.

1.2.3 PULHEMS Profile

Battle	Support	Base
3333312	3333313	4334314

2. SUMMARY

2.1 Makes complete diagnosis and performance analysis of and carries out repairs to wheeled vehicles, armoured fighting vehicles (AFVs) heavy mobile engineer equipment, compressors and similar engine driven equipments.

3. DUTIES AND TASKS

3.1 Carries out both battery and magneto ignition trouble-shooting, using electronic ignition analysers.

3.2 Analyzes the performance of gasoline and diesel engines and their components, using dynamometers and other test equipment.

3.3 Carries out precision inspection and advanced repairs to vehicles and vehicle components.

3.4 Makes repairs and adjustments to diesel fuel injection systems and governors.

3.5 Diagnoses faults in and repairs hydramatic and heavy transmissions, transfer cases and two-speed axles.

3.6 Checks and corrects frame alignment, wheel balance and steering alignment.

3.7 Diagnoses faults in and repairs attachments to engineer equipment.

Volume 10, Number 1 January 1955

RCEME TECHNICAL BULLETIN

Vol 10, No 1, January 1965

CONTENTS

The Mystique of RCEME	2
Artisan Training	5
Brainstorming Pays Off	7
Training on the Armoured Personnel Carrier – M113A1	8
Some Reasons Why the M113A1 is a Vehicle Mechanic (Wheeled) Responsibility	12
Equipment Courses - Are They Necessary at School Level?	13
RCEME in the Air	16
A 90-Mile Tape	18
How to Pass the Pre-Group 4 Assessment	21
Middle East Jeep	25
Who's Where - RCEME Officers and Officer Cadets	26
Technical Notes	31

COVER – A Sampling of Army Trade Specifications

The Mystique of RCEME

BY S SGT PETER JOHNSON

For the sake of brevity and effectiveness, "The Case for the Craftsman" focussed attention on the negative aspects of modern industrial techniques as applied to the RCEME task in time of war. The positive aspects of craftsmanship were mentioned only briefly, and no mention was made of how the spirit of craftsmanship might be encouraged despite the pressures militating against it. This sequel is intended to rectify these deficiencies and provide a basis for further discussion.

The Mystique of RCEME

To the majority of people there is something uncanny about a craftsman at work. The apparently careless ease with which a vehicle mechanic, with a few deft twists of a screwdriver, tunes to smoothness an engine that is shaking itself off its mountings, the way a radio technician pokes his soldering iron into a mass of wires, resistors, capacitors, etc, the way any tradesman handles the tools of his trade, is a source of wonder and respect to those not gifted with that particular skill and knowledge. This is the mystique of a trade – "the skill which mystifies and impresses the layman".

Over the years since its formation RCEME has developed an overall mystique based upon the craftsmanship of individual RCEME tradesmen, upon their demonstrated ability to tackle the repair of any equipment and achieve some degree of success, despite any lack of proper tools and spare parts. It is this type of craftsmanship which is desirable in the field during operations. In an emergency, an immediately irreplaceable equipment that can be made to operate at even 50 per cent efficiency by unorthodox repairs is more useful than an equipment that does not operate at all. This is the most important asset of RCEME craftsmanship, the source and justification of the RCEME mystique.

It follows that a tradesman who is willing and able, because of his knowledge, experience and attitude, to improvise repairs in an emergency is a desirable man to have in a unit. He deserves, and will probably receive, more consideration than a man who must 'ground' an equipment because the normal supply and repair system has broken down. Though it should not be considered as a right, this consideration is a bonus earned by craftsmanship, and it is this recognition, together with the personal satisfaction derived from a sense of achievement, which makes the extra effort involved worthwhile for the individual.

However, mystique is based not on words, but on concrete evidence. If there is no opportunity for the display of craftsmanship, if there is no evidence that it exists, or is being developed, then the mystique gradually disappears. No special consideration is earned by a tradesman who performs most of his work according to a drill, who apparently does not know, and has no interest in learning, the intricate mysteries of his trade. There is nothing uncanny about a man changing a module.

For this reason, if for no other, the RCEME tradesman has a vested interest in raising his own standard of craftsmanship, in displaying his interest and enthusiasm for his trade by continued study, by demonstrating and practicing his particular skills whenever possible.

With proper understanding, the RCEME mystique is a justifiable source of individual pride, an index of responsibility, and an incentive to effort on the part of tradesmen to exercise and increase their skill in the face of adversity. As such, it merits a great deal more positive emphasis in the Corps.

Encouraging Craftsmanship

The three essential elements of craftsmanship are:

This publication is issued under the authority of Col A Mendelsohn, CD, Director of Electrical and Mechanical Engineering. The contents have been edited and approved by Lt Col CMR Elmsley, CD.

The Bulletin is published to assist RCEME personnel in keeping abreast of current trends and developments and to circulate interesting news about the Corps. The information and statements herein are not to be quoted as authority for action.

EDITORS

Lt Col CMR Elmsley, CD
Mr DC Paterson

ASSOCIATE EDITORS

Col	GW	Thompson, CD	Lt Col	WG	Hamilton, MBE, CD
Col	KR	Ward, CD	Lt Col	RH	Hodgson, CD
Lt Col	WH	Glover, CD	Lt Col	GT	Kirk, MBE, CD
Lt Col	H	Goodfellow, MBE, CD	Lt Col	HM	Robinson, CD

WHAT DO YOU THINK?

This issue contains three articles on Trades Training. Not everyone will agree with the views expressed, but it is hoped that they will provide food for thought and stimulate other people to express their views in writing.

Everyone in RCEME, from the Director to the newest Craftsman recruit is concerned with this subject. Each man, at his own level, and within the limits of his knowledge and experience, forms his own opinion on the principles and purposes of the RCEME training policy, and the way it is being put into practice. Each individual opinion, right or wrong, is important, inasmuch as it affects the overall efficiency of the Corps.

Distortions and misunderstandings of the spirit and intent of policy, of the possibilities and limitations of practice, are serious; the more serious for passing unrecognized. They are due to poor communications, leading to incorrect assumptions.

The question "What do you think", posed in this space in the October issue, was not empty rhetoric. One of the main purposes of the Tech Bulletin is to provide an informal, Corps-wide, channel of communication through which opinions and problems can be aired and clarified, and incorrect assumptions corrected.

Other people are interested in what you think, because your thoughts are important, to yourself and the Corps. Address your thoughts, in the form of essays, articles, or simply questions, directly to The Editor, RCEME Technical Bulletin, DEME, CFHQ Ottawa.

CORPS DIRECTORS ABOLISHED

With effect 31 Jul 64 all non-integrated Corps Directors were abolished! This bold statement, of course, requires a considerable amplification to bring it back into context and to avoid creating the impression that RCEME and other corps have been cut adrift from their source of direction on technical and other matters.

The situation at the moment is that we now have a Head of Corps, Col Ward, who is Commandant of RCEME School, and a CFHQ Corps Representative, Col Mendelsohn, who is DEME (Army) at CFHQ.

***

The Head of Corps will be responsible to CDS, through CP, for all purely regimental matters within the Corps. He will:

Foster esprit de corps throughout the corps;

Maintain liaison with the Colonel in Chief,

(Continued on page 38)

Knowledge -
Experience
Attitude.

The standard of craftsmanship attained by an individual depends upon the quality of his training in all three elements. A deficiency in any one decreases the value of the other two, producing a disproportionate lowering of the overall standard of craftsmanship.

The teaching of theoretical KNOWLEDGE usually receives far more attention than either of the other two elements, probably because the aim is clear, and improvement and progress are easy to control and measure. At the RCEME School efforts to improve the quality of trades courses, within the limits imposed by time and money, are continuous. In addition, the following precis:

4-4-7	Job Instruction Technique
4-4-8	Communication of Ideas
4-4-9	Developing an Understudy
4-4-10/1	Training Junior Tradesmen

have been produced to assist Section NCOs and others to set up efficient 'follow-up' programs of instruction at the unit level.

These unit programs are important. Studies have shown that they are the most efficient and economical method of training craftsmen. They are intended to combine the continued study of theory with its practical application at the bench under the guidance of a senior tradesman.

However, the success of these programs depends upon the time allotted to them, particularly to the theory portion, and upon the interest and teaching ability of the Section NCO. Consistent and comprehensive programs, run with interest and enthusiasm, are essential if junior tradesmen are to gain adequate knowledge of the theory of modern, complex equipment, and attain the desirable standard of craftsmanship.

EXPERIENCE, or 'in-job training', as an element of craftsmanship, presents problems because of the conflicting responsibilities of RCEME in peacetime. On the one hand there is an understandable pressure to operate an efficient, industrial-type repair service, on the other hand there is a functional responsibility to prepare for war. The two requirements are difficult to reconcile.

If a tradesman is required to exercise initiative, resourcefulness, and a sense of personal responsibility in war, he must be given an opportunity to develop these qualities in peacetime. Yet, as has been pointed out, the trend in RCEME is understandably towards the assembly-exchange system of repair, with consequently little opportunity anywhere for the exercise of individual craftsmanship. At the present time, the only occasions when a degree of craftsmanship may be required of a limited number of tradesmen are at summer concentrations and on the UN operations. This is not sufficient if every tradesman is to gain experience in the intricate skills of his trade, in the application of his theoretical knowledge to a variety of unpredictable problems.

In this connection, it is suggested that it would be desirable if Permissive Repair Schedules could be ignored for training purposes, as part of a regular training program. Under suitable controls, detailed repairs could then be carried out in all units, limited only by the tools available and the initiative and resourcefulness of the tradesmen involved. Such a training program would provide the opportunity for the widespread practice of craftsmanship essential to its continued existence in RCEME.

Naturally some of these repairs may be temporary, requiring replacement of an assembly at a later date, after the effectiveness of the temporary repair has been proved and the training value exhausted. This may cause concern about the possible lowering of the peacetime efficiency of RCEME services. But if the desirability of craftsmanship is acknowledged, then some training programs involving the exercise of craftsmanship is essential, and whatever program is chosen, it is always possible that it will result in some loss of efficiency. The only question is, does the end justify the means? Is the gain in RCEME craftsmanship worth the debatable loss of efficiency?

ATTITUDE, morale, the spirit of craftsmanship, call it what you will, it is nevertheless the Cinderella of the elements of craftsmanship in RCEME, for little or no attention is paid to this important element in specifically RCEME terms.

The emphasis on modern industrial methods down-grades the importance of theoretical knowledge, initiative, and resourcefulness, and inevitably brings in its wake a lowering of the general sense of personal responsibility, as

described in the previous essay. The disbandment of distinctively RCEME units, and the consequent isolation of RCEME personnel into small anonymous groups, the tendency of parent units to demand conformity of dress and military skills to non-RCEME patterns lead to a general belief in the declining importance of the RCEME tradesman and the RCEME function, which is not offset by the steady but unspectacular increase in the size of the Corps and the scope of its responsibilities.

The unique responsibility of the RCEME tradesman, the man who actually handles the tools, is: to maintain the electrical and mechanical equipment of the army in battleworthy condition at all times, under all circumstances.

To carry out this responsibility, in peace and war, he requires, not the attitude of the 'Arms' soldier, not the attitude of the contented civilian worker, but a specifically RCEME attitude suited to his specific task as defined above. Since he must operate in a military environment, he should be prepared to carry out his purely military duties efficiently, and recognize their importance. Yet at the same time he should have a strong sense of personal responsibility for the fulfillment of his part of the primary RCEME task, to keep weapons in the hands of those who are trained to use them, and realize the importance of developing a high standard of craftsmanship to meet the demands of this task in both predictable and unpredictable circumstances.

If the spirit of craftsmanship is to be encouraged, then the importance of the RCEME function should be constantly reaffirmed and emphasized. The essential part played by each RCEME tradesman, as a tradesman, wherever he may be, the necessity of his developing a high standard of craftsmanship, should be stressed as contributing directly to the success of the RCEME operation, and therefore to the efficiency of the army.

A positive approach to the question of attitude is essential if the spirit of craftsmanship is to be encouraged in RCEME. While everyone in the Corps has some responsibility in this respect, the main responsibility is borne by the NCOs, for they provide the most convenient example, have the most influence, and control to a large extent the impact of the day-to-day occurrences which affect the lives and attitude of junior tradesmen.

Conclusion

An attempt has been made to show that craftsmanship in RCEME is essential if the Corps is to fulfill its function in war as well as peace. In spite of the increasing complexity of modern equipment, emergency repairs which would not be considered in industry are still possible providing the necessary knowledge and skills exist. The probability that such repairs will be essential in the army in time of war justifies the encouragement of RCEME craftsmanship.

The traditional method of training (which has proved its effectiveness over hundreds of years, and which is now being used in RCEME) is for senior tradesmen to pass on their knowledge to junior tradesmen, to ensure that junior tradesmen get suitable experience, and to communicate their interest and sense of responsibility – their attitude – by their good example and influence. The main responsibility for the development of craftsmanship rests, as it has always rested, with the tradesmen themselves.

However, their task is impossible without adequate allotment of training time, without provision of opportunities for the practice of craftsmanship, without the existence of a favourable climate of opinion, an enthusiasm for craftsmanship throughout the Corps. Thus, everyone in the Corps shares the responsibility for the encouragement of RCEME craftsmanship, for the maintenance and vindication of the 'RCEME Mystique .

FIRE PREVENTION WEEK AT 202 BASE WORKSHOP RCEME

The high point of Fire Prevention Week activities for the workshop is the Longue Pointe Garrison parade of unit floats. Each unit entry is paraded through the camp area and a fire drill at this time ensures that every individual has the opportunity to view the parade.

This year the unit committee chose the theme " The Right and Wrong Ways of Fighting Fires". Sketches produced by Ssgt Gord Cruickshank were further developed by him; WO 1 Ken Lee was selected as project supervisor; material was somehow found and the

ARTISAN TRAINING

By Mr J Pollard
Armament Company,
RCEME School

The landed gentry of the last century regarded with admiration the skilled tradesmen who made their carriages, the wooden spoked wheels, shod their horses, made the saddles and made the furniture for their homes. All those things which contributed greatly to the standard of living which evolved thereby from the pioneer stage. They called these tradesmen "artisans". The connotation of this name to the word "art" is significant, for the artisans had great creative ability as can be attested to in our museums. With the advent of industry, naturally the artisans became the core workers in the factories. To their manual skills they added machine tool operation skills and gave up gradually the design aspect of their work, to the engineers. Technology has gradually reduced the traditional reliance on artisan skills. However, there is an irreduceable capability in this regard for any tradesman who must be self-reliant in his work. The military tradesman is prepared to work under unique conditions which make self-reliance very important and therefore his artisan ability has to be well developed.

One of the duties of Armament Company

---

float was under way.

Although the workshop entry was not officially recognized as a prize-winner, there was no doubt that the garrison personnel enjoyed viewing this graphic and well-presented message.

of the RCEME School is the artisan training and this is carried out in the section of the company known as Artisan Platoon (formerly Artisan Company, before amalgamation with Armament Company in Nov 58). Most of the trade courses start in Artisan Platoon and some, such as Machinist Fitter and Metals Technician, take all their training there. The other courses on completion of the Artisan Training go elsewhere for their equipment training; in this category are the Weapons and Instrument Technicians; Vehicle Company trades of Vehicle Mechanics (Wheeled and Tracked); Electronic Company trades of Radio and Electrical Technicians; and Regimental Company (ROTP/COTC Cadets).

If at all possible, the Artisan training is scheduled when it is most convenient for the parent companies. In the case of Vehicle Mechanics it has proven to be most helpful to have the artisan training occur before the vehicle training. In the case of the electronic trades, the relation of timing artisan to equipment subjects is not too important. The effect of these "Out of Company" commitments does have an effect on the student loading within the platoon and it is not uncommon to have considerable fluctuation in student strength.

The scope of artisan training for these students is of course dictated by the applicable training standards and trade specifications, and the length of training may vary from three days to seventeen weeks. At one time the training for other companies was fairly extensive and for some trades covered all aspects of machine shop work. Today, however, with the changes in trade specifications all "Out of Company" training, with the exception of that given to cadets is limited to reading mechanical drawing, soldering and bench fitting tools and practices.

Despite the extensive mechanization of the modern machine shop, the hand processes such as filing, drilling and riveting, etc, remain of prime importance. Before anyone can lay claim to being a RCEME technician, he should understand these skills and be able to do them correctly. It is of course possible to train a man to operate an automatic machine tool without first teaching him to use ordinary hand tools, but it is unlikely that he will be as efficient as one who started at the beginning.

There is also another important aspect in the skillful use of hand tools. The various processes are essential to the fitter to whom the machines are of little use. Once the tradesman is able to file accurately, to lay out the metal on which he is to work, to cut and drill it, and to form screw threads he is well on the way to success. Because of the importance of the correct use of hand tools, a standardized bench fitting course for all RCEME tradesmen, regardless of trade, would be of immense value to the student and the corps.

During the Bench Fitting Training all common shop functions are taught: layout, filing, hacksawing, drilling, cutting screw threads, etc. Of these functions filing is probably the most contentious as far as the student is concerned. When he can look all around and see lathes, milling machines, shapers and grinders removing metal probably a thousand times faster than he can do it by filing, he wonders why he has to file at all. But machines may not always be available. Although filing is an art in itself, changes in trade specifications have considerably reduced the training time formerly allotted to this skill.

Unlike the training for tradesmen which commences in September and continues throughout the course year, the students from Regimental Company (ROTP/COTC Cadets) usually arrive at Artisan Platoon in May and continue to arrive sporadically until mid-September. During this period the regular training load in Artisan Platoon is normally light and this is an advantage to the cadet because it is often possible to tailor the Machine Shop training to the cadet's individual needs. While bench fitting is covered in cadet training all other subjects such as welding, heat treatment, milling, shaper, grinders and lathe are usually available and have been popular choices in the past years.

With the promised integration of the Armed Forces looming on the horizon it is interesting to note that Artisan Platoon commenced teaching machine shop to Royal Canadian Signals personnel in Sep 64. This was basic bench fitting and lathe and was given to selected Foremen of Works and Equipment Technicians. Inasmuch as we in Artisan Platoon have already introduced Eskimoes and Royal Canadian Mounted Police to the mysteries of basic tool operations, we feel that integration, at least to us, poses no problem.

BRAINSTORMING PAYS OFF

By Maj WE Ellis

We had a problem here at 3 Coy RCEME which I consider may be of interest for you as an article for the Tech Bulletin.

The Problem

The MSS needed a means of removing and replacing heavy wheel assemblies to permit the inspection and repacking of wheel bearings.

Observations

The workshops are equipped with 4910-21-109-6023 Truck lift wheel 1200 lb for this function. However this tool is far too heavy and cumbersome for the MSS to use.

A number of lever arrangements were considered by the HQ staff. Then at a meeting of all the workshop officers, the problem was submitted for a five minute brainstorming session. It took less than two minutes to find the answer.

Solution

a. Jack the wheel clear of the ground.

b. Place a 2x3 ft sheet of plywood under the wheel, (3/8 to 3/4 inch in thickness, whatever is available).

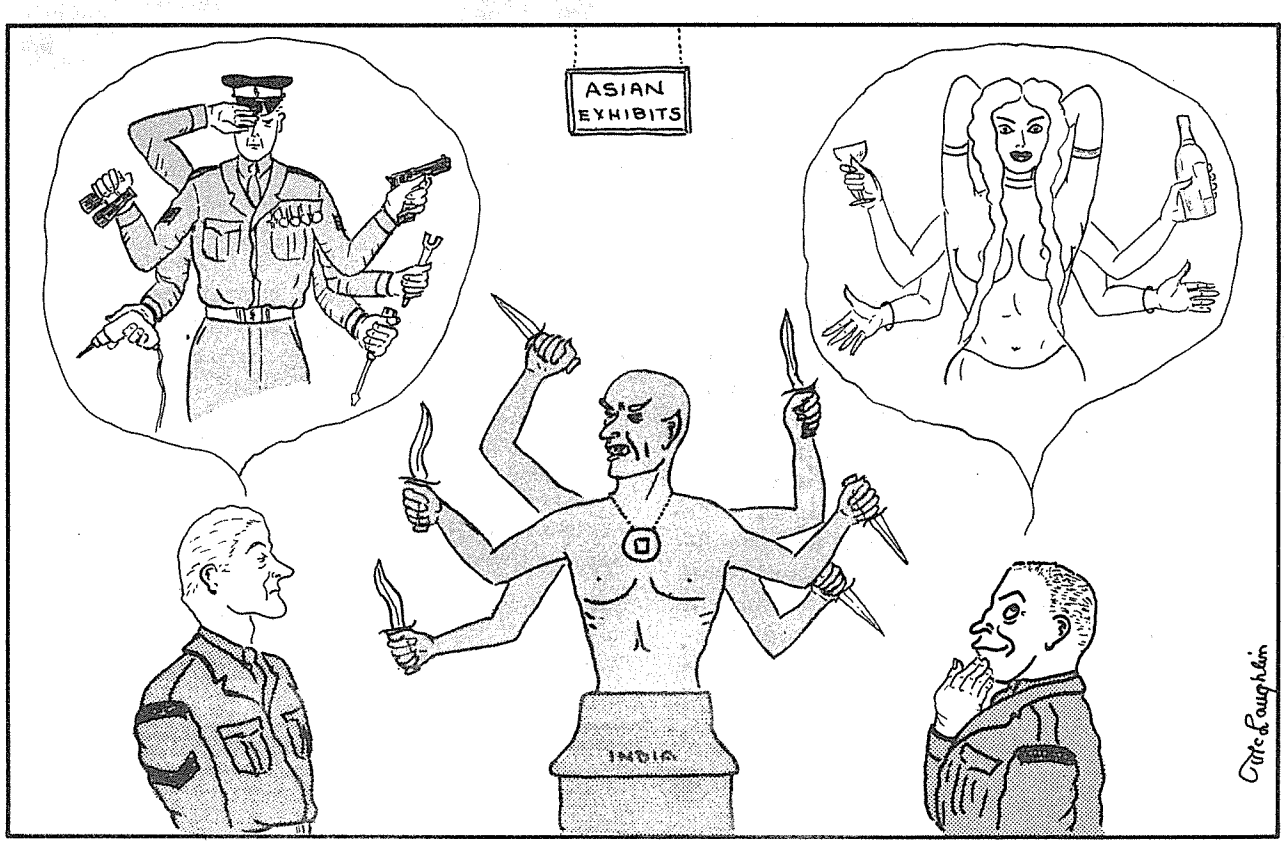
c. Liberally coat the surface of the plywood with grease where the wheel will come in contact.

d. Adjust the jack height so that the tire is bearing slightly. Take off the wheel axle nut and slide the wheel assembly off the axle along the greased plywood surface.

e. The reverse procedure can then be used to replace the assembly.

Comments

The idea works in practise. Expense is negligible, the greased plywood can be wiped with old newspaper and stored easily in the MSS vehicle.



TRAINING ON THE ARMOURED PERSONNEL CARRIER – M113A1

By WO1 RH Stewart

In March 1964 Major DJ Tremeer, British Exchange Officer and Officer Commanding Vehicle Company, the RCEME School, visited Fort Benning, Georgia, for familiarization on the operation and maintenance of the Armoured Personnel Carrier M113A1.

Then in July and August, Staff Sergeants RJ Curran, P Funk, BR Hein and GJ Turcotte encamped at the Detroit Arsenal Tank Automotive Centre in Warren. Michigan, for more detailed training. *

Moving eastward from San Jose, California, were two carriers destined for the RCEME School. They arrived October 14 to become the subject of press photographers and the local TV cameramen. The carriers are shown at photograph A with Sgt H Balfour, RCASC representative, and WO2 S Anderson, RCEME representative, responsible for unloading and transporting the vehicles to the RCEME School.

Also moving in from California came Ivor Allen and Jack Earle, instructors from the Food Machinery and Chemical Corporation (FMC). Mr Allen and Mr Earle may be seen in photo B being welcomed by Major Tremeer and Capt WF Lucano, training officer of Vehicle Company.

Thus on November 2 there was assembled on the east bank of the Cataraqui River, one British Army major, one Canadian Army captain and four staff sergeants, two American civilians and nine students. Why? Obvious isn't it. Nevertheless it was a significant occasion, for here was the start of a training program that was planned many months in advance to train mechanics in the electrical and mechanical maintenance of the vehicle – significant because RCEME was receiving the equipment first, so that we could better provide maintenance to the user when he received the equipment.

Prior to November 2, the vehicles were deprocessed, the additional training assemblies were made ready for instruction, and the first draft syllabus was prepared without recourse to manuals.

Major Tremeer and Captain WF Lucano greet Messrs Allen and Earle on their arrival.
Photos by Capt WA Thomas

Photo D shows Ssgt RJ Curran and Ssgt GR Hein with Mr Earle examining the power plant, and E shows Ssgt Turcotte starting the power pack. The pack comprises engine, transfer case and transmission.

Photo F is a layout of tools and equipment

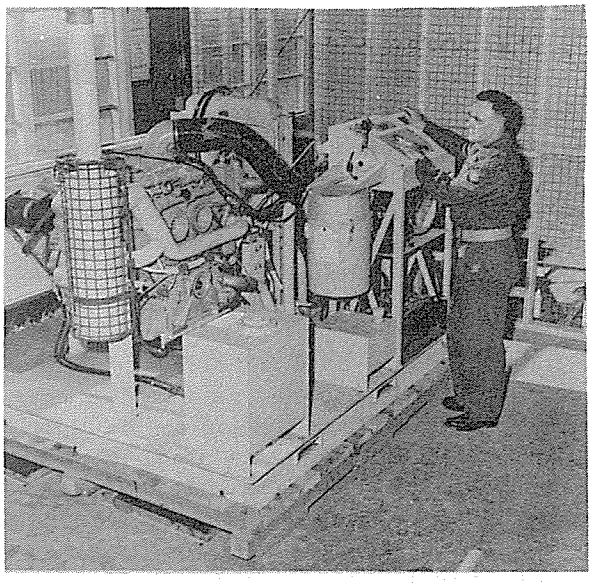
* There were, in fact, two courses on the M113A1 at Detroit Arsenals. Attending these courses were:

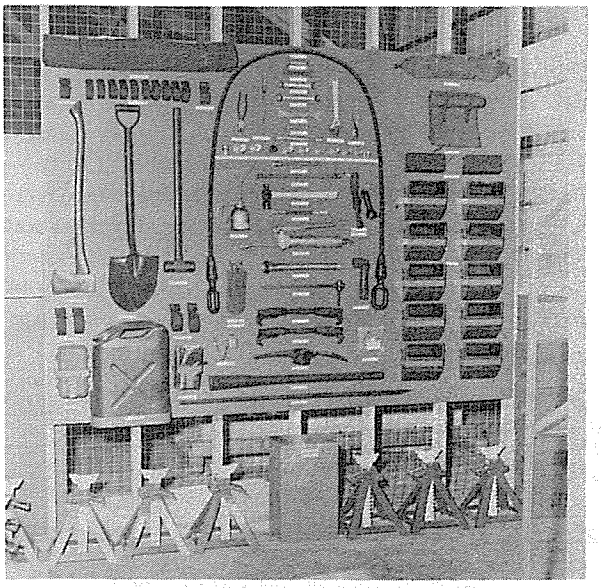
1st Course			2nd Course		
WO1	DJ	MacDonald	WO1	JD	Snell
WO2	PM	McGovern	WO2	HC	Milne
WO2	MH	McLeod	Ssgt	P	Funk
WO2	E	Bailey	Ssgt	GR	Hein
Ssgt	RJ	Curran	Ssgt	WJ	Nelson
Ssgt	GJ	Turcotte	Ssgt	WT	Leach
Mr	R	Moore	Mr	IW	Ferguson

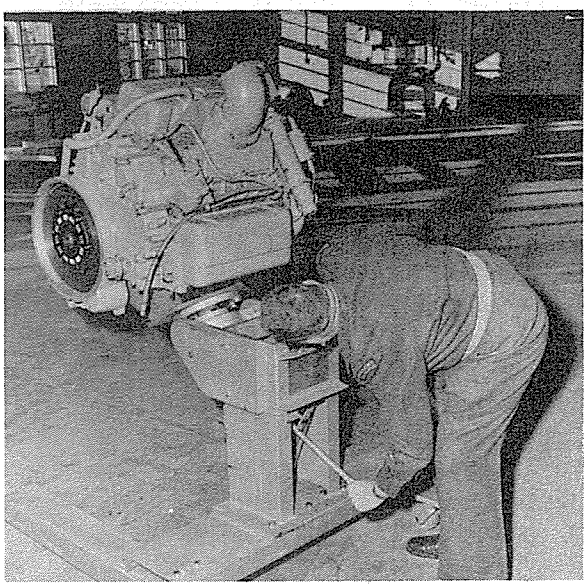
done by Sgt RC Meints. The author in photo H is changing the position of the engine on this special stand which allows the engine to be moved through both horizontal and vertical planes. Using the HIAB Crane, the first class may be seen removing the engine from the carrier, photo J; and Sgt DE Armstrong is fastening the transmission to the transfer case, photo K.

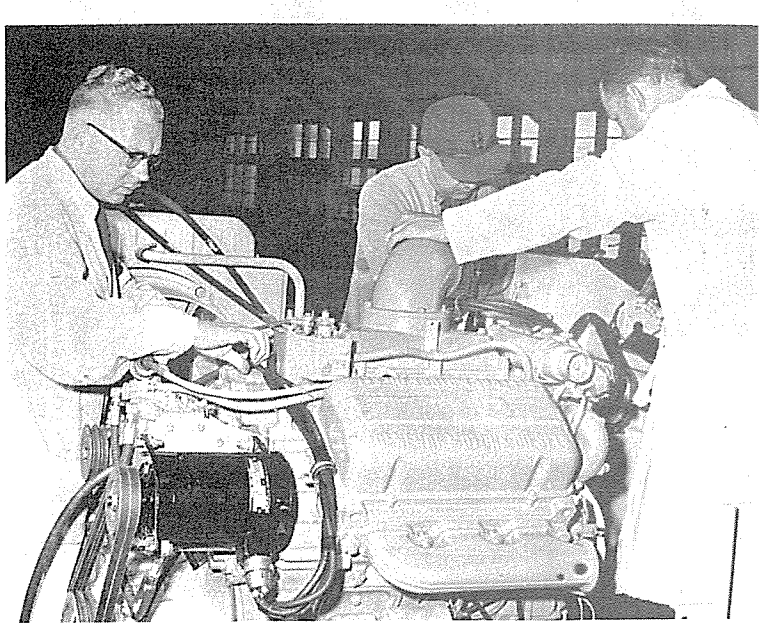
During November Captains AM Adams, GW Keyes and GD McCullough were schooled in the operation and maintenance of the carrier before being posted to units in Europe that will be receiving the carrier.

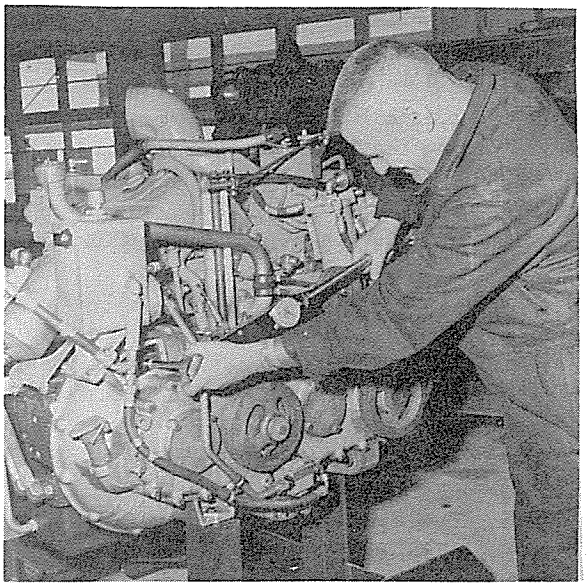
Also during November, teaching in the technique of welding aluminum armour plate was given. An interesting feature in the processing of this plate is that it gains its strength











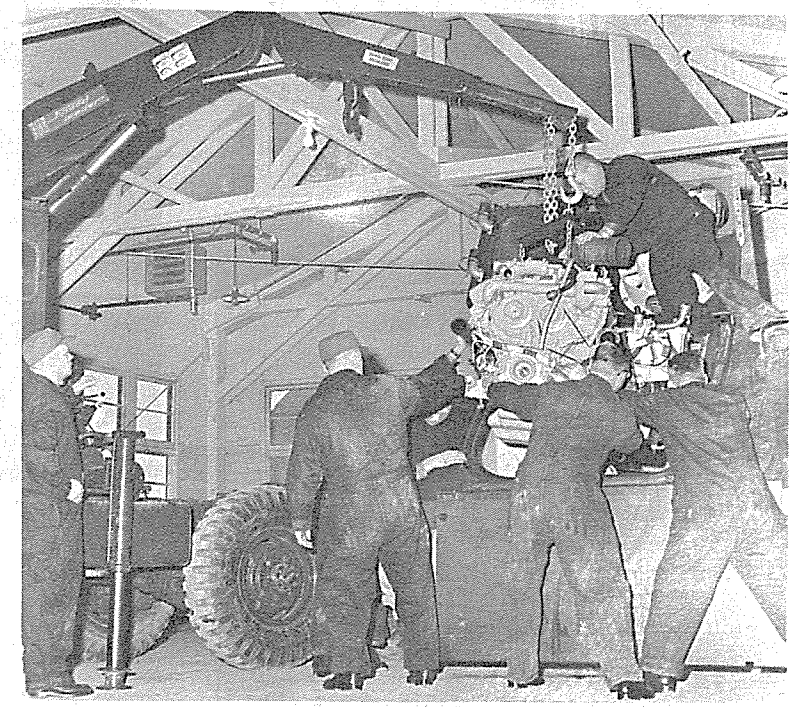
by being stretched rather than by thermal treatment. The plate is marked to a 100-inch length then stretched to 105-108 inches – then resawed to the 100 inch size. Shown at photo M is Sgt OA Trites demonstrating correct use of chipping gun used in the preparation of welding operations, to Wally Brum and Ivor Allen.

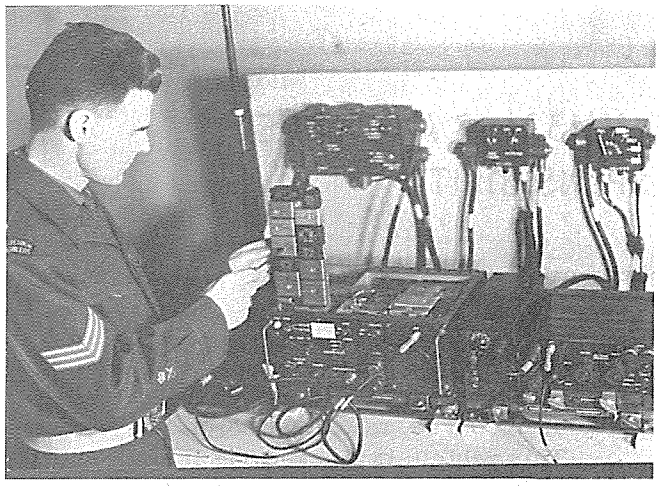
Electronic personnel were pleasantly surprised to learn about the ease of maintenance of the radio equipment. Sgt JA Wilson at photo N demonstrates the ready removal of a subassembly from one of the M113A1's radio sets.

The class which started training on November 2 was scheduled to receive six weeks training on the field maintenance course plus 12 weeks on the base repair of the vehicle components including the engine and transmission. After five weeks training the comments of this class were carefully screened, and their recommendations were examined prior to the start of the second field maintenance course November 30. Thus there was a rapid review and rewrite of the syllabus for the next field maintenance course. By this time, however, the draft manuals were available so the syllabus was more accurately prepared. Simultaneously the provisional training standard was drafted using both the draft manuals and the permissive repair schedule (PRS) from the EME Manual.

In April 1965 two additional carriers with sky hooks are expected! Sky hooks will be needed because by that time we will need a training station in outer space as the available area in the South Wing of Building A7 (Armament Company) will be packed to the rafters!

In the meantime there it is: from Fort Benning to Detroit to San Jose to the east bank of the Cataraqui River, our new purchase of technical equipment takes its effect on training.





4 FD WKSP RUNS M113A1 APC COURSES

Recently the 4th Field Workshop, RCEME, at Fort Chambly started a Maintenance Training course on the Brigade's new M113A1 Armoured Personnel Carrier (APC).

The builders of the M113A1 are the Ordnance Division of the Food Machinery and Chemical Corp, an American firm, who have seconded two of their employees to 4 Fd Wksp for the duration of the courses.

The present course consists of eight Sr NCOs from 2 RCHA, 1 RCR, 1 PPCLI and 4 Fd Wksp under the tutelage of Mr Bard Johnson and Mr Max Snavely, the two representatives of FMC.

These candidates are presently learning how to drive, service and repair the APCs. Similar courses will continue well on into the summer followed by driver-operator training for unit personnel of the Brigade.

Sub-unit tactical training is scheduled to take place next fall. It is then that those who are to be the drivers of the APCs will learn all about the role of the APC in modern warfare.

The officer in charge of the courses at Fort Chambly is Capt MC Johnson of 4 Fd Wksp.

- The Beaver

Cpl R Alger at the driver's position and Sgt R Waite in the crew commander's hatch (4 Fd Wksp) try out the new APC.

(PR Photo)

The M113 armoured personnel carrier, one of 300 to be delivered to the 4th Canadian Infantry Brigade Group in Germany in 1965, is checked out by RCEME personnel on the first maintenance training course held by the Brigade. The trio, Cpl Cliff Evans, left, WO2 Herb Krupp and Sgt Joe Blanchard, will qualify as instructors upon graduation.

PR Photo and caption

SOME REASONS WHY THE M113A1 IS A VEHICLE MECHANIC (WHEELED) RESPONSIBILITY

By Capt WJ Shearing

Why is the vehicle mechanic wheeled responsible for the M113A1? This question has been heard a number of times in DEME. It's assumed that it is being raised quite often in the field. It is hoped that this article will shed some light on why the decision was made.

Many factors were considered before making the final decision, but "manpower" was the most important one in the DEME appreciation. Under manpower such things as the number of M113A1s in the system, their distribution, the number of tradesmen required to support them, the availability of tradesmen for the support of the vehicles, and the training requirement had to be considered. These points will be discussed here.

Approximately 1000 vehicles of the M113A1 family will be introduced into the Canadian Army in the next two years. The infantry battalions will be the major holders of the vehicles, but they will also be in armoured regiments, artillery regiments, engineer squadrons, the reconnaissance regiment, and the anti-tank battalion. Such schools as the RCAC School, RCS of I, RCS of A and RCS of S will have M113A1s. The M113A1 family is therefore distributed in Europe and throughout Canada – RCEME tradesmen will be repairing M113A1s in nearly all field units and static workshops.

The 'yardstick' being used in DEME for the M113A1 is four workers (craftsmen to corporals) for unit repairs and three workers for field repairs for every twelve vehicles. An example of the manpower required might be shown by considering an infantry battalion. For every 12 APCs in 1 PPCLI, the battalion will have four workers and 4 Field Workshop will have three workers. This yardstick does not include supervisors. Using the yardstick, 1000 vehicles will require approximately 580 workers to carry out unit and field repairs. When supervisors are included, the total requirement for vehicle tradesmen will be in the order of 700. A much larger number must be trained, of course, to account for postings, etc.

This vehicle is tracked and it has a diesel engine. It seems only natural that the tracked mechanic should be responsible for repairs to the M113A1. Do we have enough track mechanics in the system? At the present time, we have only 470 vehicle mechanics tracked compared with 1400 vehicle mechanics wheeled. The Corps must grow because of the introduction of the M113A1, and it will be easier to absorb the workload with wheeled mechanics rather than with tracked mechanics.

If the vehicle mechanic tracked had been responsible for the M113A1 there would have been a shortage of tracked mechanics and a surplus of wheeled mechanics (a result of replacing 3/4 tons with APCs). The surplus wheeled mechanics would have had to be remustered. The training required to remuster a vehicle mechanic wheeled to a vehicle mechanic tracked would be a 20-week conversion course. In addition, the vehicle mechanic tracked employed in an infantry battalion or a workshop supporting units other than armoured regiments might never see a tank again which would create problems. Among other things he would be overtrained and probably lose some of his knowledge due to lack of application. An equipment course would be required for either trade. It was felt that a six-week equipment course for wheeled mechanics would be a saving in training. The M113A1 will be included in vehicle mechanic wheeled group 1 and group 3 courses when sufficient training equipments become available.

The responsibility was therefore given to the vehicle mechanic wheeled because of:

a. the large number of tradesmen required and now available in the wheeled trade, and

b. the smaller training load.

EQUIPMENT COURSES

Are They Necessary at School Level ?

By Electronic Company, RCEME School

The Canadian Army realized long ago that modernization is the key to an effective Army in this age of technological advancement. The Army with the most advanced equipment will have a decided advantage over any opponent.

Modernization means new extremely complex equipments which require skilled operators and, in particular, highly experienced maintenance technicians. This in turn means training of a high calibre because this age of precision has retired, for all time, the hammer and chisel tradesman.

Each new equipment requires a maintenance and repair course of some description – the question is what type? Should these courses be conducted at the school level or at the unit level? Each method or level has its advantages and disadvantages and these will be discussed in some detail to determine the best approach.

In considering the many factors involved, six were finally chosen. They are:

Effective Instructors
Equipment, Training Aids, and Reference Material
Uniform Standard of Training
Central Control of Qualifications
Time
Travel and Accommodation

Effective Instructors

The three most important requirements of a good instructor are a thorough knowledge of his subject, a strong desire to teach, and the ability to communicate with his students. If he possesses these prerequisites, he will automatically have the necessary confidence and enthusiasm.

A man employed as a full time instructor will start his teaching career possessing some of these characteristics and will quickly develop the others. If he does not, he will soon be directed to a different form of work. This then is a description of an ideal RCEME School assistant instructor for whom teaching is a full time job.

How would a man employed as a supervisor in a static or field unit measure up if asked to instruct on a part time basis? Should he be required to refresh and improve his knowledge of certain subjects far beyond a passing standard at the expense of his usual objectives, ie, efficient supervision of his section, meeting production target dates, etc. Is he likely to have a strong desire, if any, to teach while living in an atmosphere of production deadlines? Such a man could be an excellent supervisor and have the potential to become a good full time instructor but would most likely be a mediocre teacher if asked to perform both functions at the same time.

If a RCEME School assistant instructor and a RCEME workshop supervisor were given the same training on a new equipment, it is reasonable to conclude that the assistant instructor should be the one most capable of teaching an effective equipment course.

Equipment, Training Aids and Reference Material

These three items strengthen the argument that new equipment courses should be centralized at the school level. All three must be available when teaching a course, especially the equipment itself. However when new equipments are first introduced they are generally in short supply – three might arrive. At present the policy is to allot some of the first production models to the user units and one to the RCEME School for maintenance training. Then when enough equipments are available for issue in bulk to units, there are enough trained maintenance technicians available to provide adequate support.

On the other hand if unit level maintenance training is carried out when bulk shipments arrive at the unit level there would be a considerable delay in maintenance support.

Training aids are special devices used to reinforce instruction. They are only economical when used many times. This would be the case if many courses were run at the school level.

Unit level courses would require many more volumes of reference material as each student should have a reference text. At the school these texts can be used over and over again.

Uniform Standard of Training

A uniform standard of training can best be accomplished at the school level. How is this done? Normally the same instructors are used to teach the same course many times. Each time they gain more knowledge from the questions asked, more insight into student problems and more experience in presentation of the subject matter. Not only is the standard maintained; it is improved over a period of time.

In comparison, what is likely to occur at the unit level? Here we have a number of individual courses all conducted by different people each setting their own standard. It would require a central examination board to ensure that each student met the course standard. And what of the student, does he receive the same opportunity to learn that is given to the student in another unit? There are too many variables in teaching at unit level so the answer is no. Uniformity of training and equal opportunity for all students can only be accomplished at the school level.

Control of Qualifications

It is not possible to maintain an adequate control of qualifications if equipment courses are conducted at the unit level. Depending on their nature new equipments are not sent to all units. Suppose unit A runs a course but unit B does not – where and when do the tradesmen from unit B receive their training? Must they wait until posted to unit A? Is unit A then to run a course for one man because all the rest are qualified? It would appear that the unit level equipment courses would be difficult to control.

What of career planning? The planners must know who is qualified in order to determine postings and promotions. Returns coming from many units at various times would soon confuse the issue.

Time

To set up a new equipment course at the unit level involves one very large problem, where does one find the time to do it? The course should if possible be full time so how do we meet production deadlines? There is also a sense of urgency, these new equipments will soon be in constant use requiring trained maintenance personnel. It is not always possible to choose a period when the workload is light. To sum up, each unit has its particular function in day to day operations. Its establishment is based on this workload. Any new function such as an equipment course would have to be superimposed on its normal commitment. In comparison the school would be alotted sufficient time to run the course and this would be its only workload.

One further fact involves the candidates. At the unit level, are there enough tradesmen available to make the course worthwhile and can they all be spared? It is a much better plan to run a course at the school level and choose one candidate from each unit. In this way the unit can carry on its normal work on a slightly reduced scale.

Time is not so important at the school level. Time is allotted by CFHQ and there are few interruptions. Selections are made from various units so the effect on production is minor. The student forgets his everyday job and concentrates on the task of learning this new equipment.

Travel and Accommodation

These items seem to favour an equipment course at the unit level. It is an expensive proposition to bring students to the school and also provide accommodation. There is also a possible loss in morale because families are separated.

There are however certain advantages to a course away from home. For one thing the

student is free to devote more time to study because he is not involved in family or community affairs. There is in fact a favourable atmosphere of learning brought about by a change of environment. A change is as good as a rest because the mind is stimulated into learning something new. A student who shows interest and enthusiasm will learn faster and easier. Is this worth the trip down?

The majority of the factors discussed seem to favour equipment courses at the school level. There may be other factors we have not touched on but none the less we have built up some strong arguments to support the present system.

LONDON CIVILIAN WINS SUGGESTION AWARD

Mr JA Woodfield, 27 COD Workshop Branch, was presented with an award cheque and certificate for suggesting a method of restoring worn rocker arm pin holes on fuel and vacuum pumps for 3/4 ton SMP vehicles.

Three factors prompted this suggestion: high mortality rate due to excess wear; high cost of replacement units; and low stock level and availability.

The first step was the purchase of hard brass tubing having the desired outer and inner diameters. This was purchased from a manufacturer at a very nominal cost.

The fuel pump body holes were drilled oversize. Brass tubing was cut in 1/4 inch lengths to make bushings. Two bushings were pressed into pump body. Inner diameter of bushings was line reamed to size of rocker arm pin. Complete assembly was tested and proved satisfactory.

Lt Col GT Kirk presents a Suggestion Award cheque and certificate to Mr Woodfield; at the right is Capt JL Moyse, OIC Production Group.

RCEME IN THE AIR

An Editorial

Jay T. Robbins
BRIGADIER GENERAL, USAF
DIRECTOR OF AEROSPACE SAFETY

Before the advent of jet aircraft, missiles, and rockets, the Air Force maintenance supervisor was expected to personally oversee all actions taken. If necessary, he could actually perform the task at hand.

As the birds and their ancillary and ground support equipment became more and more complex, it became necessary to centralize the maintenance system. Advances in Space Age technology dictated that specialized technicians be trained to maintain individual components and subsystems that had become too numerous and too complicated for any one supervisor to handle. Now, as before, the supervisor is charged with protecting invaluable lives, but he has no other choice, maintenance-wise, than to "let Joe do it." But, the big question is: "*Who* is going to show Joe how to do 'it'."

The actions of some of our supervisors indicate their beliefs that informal training is not a part of their obligation, but that it is a function of Air Training Command's mobile and field training units, or the contract instructors on hand when new weapon systems are introduced. These misinformed supervisors fail to carry out one of their prime responsibilities: the *personal* responsibility of planning and conducting a unit training program, tailored to include the instruction of the newest airman fresh from technical school, *and* of the most experienced mechanic awaiting the opportunity to move up in his own specialty.

The two training areas that should be of most interest to the maintenance supervisor are on-the-job training and continuation training. When the new man is working side-by-side with an experienced technician, he profits from the example and know-how of his instructor/supervisor. Since he works while he is learning, the unit gets the job done without suffering the delays that would result from the establishment of separate training programs.

Many supervisors think of OJT only in the narrow terms of personnel shortages and crowded maintenance schedules. They have made the altogether fallacious decision that it is too expensive to utilize valuable man-hours in teaming new troops with old hands on a one-man job. In so deciding, they have accepted the risk of inexperienced personnel being assigned to jobs that are beyond their capabilities. They can only *hope* that some busy technician will find the time for a word of advice and an occasional check of the novice's work.

Turning newly graduated tech school technicians loose on their own might have been effective in some instances, but we have accident reports to show that the final cost has not been worth the chances taken: a supervisor too busy to take an occasional look . . . a new man hesitating to expose his ignorance by asking for help . . . another bulling a job through, instead of going for help, for fear of falling behind on a rush job. . . . They have resulted in totally unnecessary accidents.

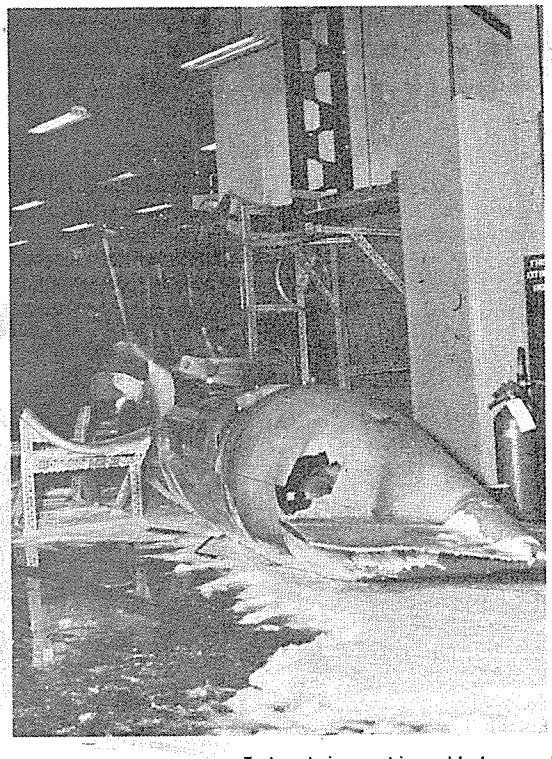
Such maintenance-induced mishaps can be minimized. Supervisors must be indoctrinated in the basic purpose and potential benefits of on-the-job training. They must be supported by command interest all along the line. On-the-job training need not be shunted aside because of excessive work schedules. I know from personal experience that normal operations *can* be carried out in conjunction with an intelligently planned OJT program.

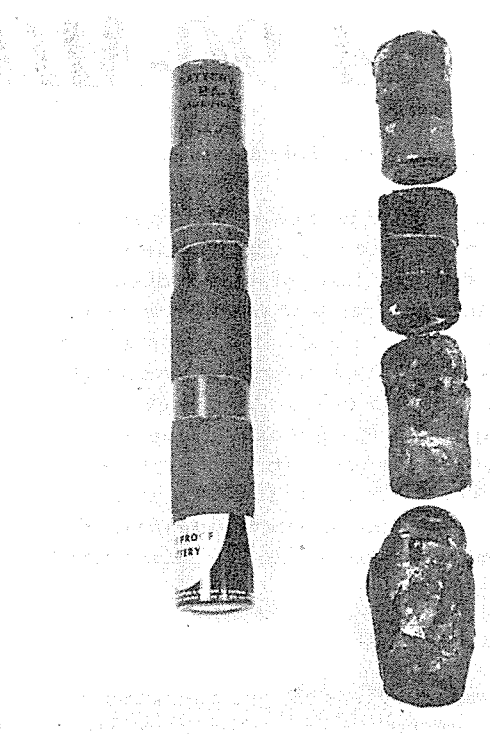
Continuation training is a necessary adjunct to both tech school and on-the-job training. It is the only sensible means of keeping OJT graduates, as well as the seasoned technicians and supervisors, informed of new procedures, techniques, and maintenance concepts. It is, in fact, the only way that anyone can keep on top of his job.

Technical school training, on-the-job training, and continuation training are three closely related elements in a complete training program, and it was never intended that one should substitute for another.

The supervisor and the commander should take equal pride in a well organized training program, for it generally indicates a well run outfit. You can hardly have one without the other.

Take time! Use approved procedures!





Tank explosion was triggered by home-made tester made up of batteries as shown on the right.

Fatal Flash

Ingenuity, when improperly applied, can quickly become a liability rather than an asset. Consider this case in point.

A 450-gallon external fuel tank exploded in a fuel tank repair shop. The blast killed two tank repair men, and a third suffered second-degree burns over twenty per cent of his body. In addition, a fire was started and the blast caused considerable damage to the building and fixtures.

What caused the explosion? The answer to this question was shockingly simple. The three technicians were performing an operational check of the drop tank refueling control valve. Their power source was a homemade electrical tester made up of four flashlight batteries taped together in series. The connection from the batteries to the control valve terminal strip consisted of two strands of .017 steel safety wire. The circuit was completed by touching the wires to the connections exposed by the removal of the electrical connector access door on the top of the tank. This haphazard contact created a spark that ignited residual fuel vapors escaping at the tank skin cup of the access door opening.

The subsequent investigation brought to light a number of weak spots in the supervision of the tank repair shop, including the fact that a tank containing residual fuel was allowed to enter the shop. But these findings are incidental to this story.

What is most ironic is that two men should die while performing a check of the control valve operation — a check that *was not even required* on this particular tank repair job! And the fact that the technicians were using a jerry-built piece of electrical test equipment in a hazardous area *without the supervisor's knowledge* is particularly difficult to understand.

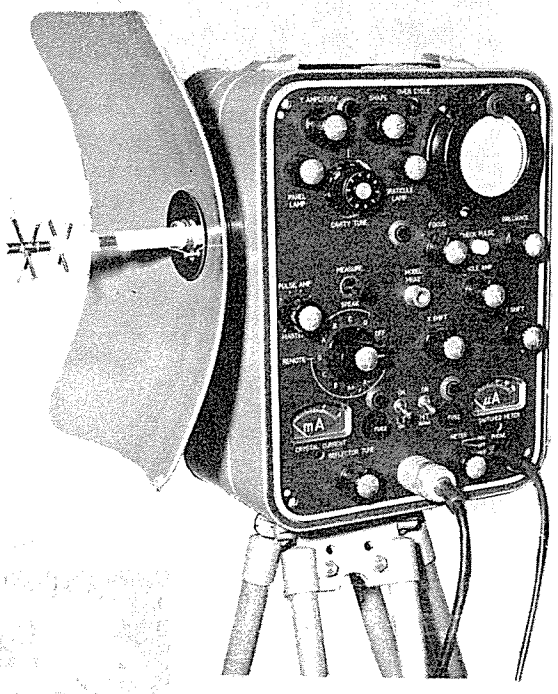
-Aero Space Maintenance

The following article is an attempt to partially meet the need for a visual presentation of the principle of measurement used in the Tellurometer, in a manner both interesting and understandable, even to those without previous electronics knowledge. (It has been "test-marketed" on the writer's wife with encouraging results).

A 90-MILE TAPE

By S Sgt Peter Johnson

The Tellurometer is an electronic survey instrument which provides a simple means of measuring the direct, line-of-sight distance between two points with an accuracy of plus or minus a few inches. With it, it is possible to measure the distance between two mountain tops 90 miles apart, or two points the length of a football field apart, with precisely the same ease, speed and accuracy. It is most useful in the measurement of relatively long distances in situations where orthodox surveying methods are impractical because of limited time and difficult country.



Physical Description and Use

The system consists of two identical 30 lb metal boxes, about 15 by 11 by 12 inches, each with a number of controls, and dials, and a CRT (a TV picture tube) on one face. (See illustration). The 'rectangular dish with rounded corners' on one side is a parabolic reflector, which focusses high frequency radio waves into a beam in the same way that the silvered back of a sealed-beam headlight focusses light into a beam. In the centre of the 'dish' is a short post with 5 cm receiving and transmitting antennae mounted on it. Each set is mounted on a wooden tripod and requires a 12 volt storage battery for power.

To measure the distance between two points, one set is placed at each location with the 'dishes' pointed directly towards each other with no obstructions, ie, hills, buildings, trees, etc, between them. One set is designated as the Master station and the other as the Remote station. The two operators can talk to each other through the system with headsets, and the Master operator controls the measuring procedure.

The controls are adjusted and the Master operator takes readings from the CRT as both operators switch simultaneously to four separate measuring frequencies. Readings are also taken at three other frequencies, but only to correct minor electronic errors in the system. Once the readings have been taken, the exact distance can be calculated rapidly using simple arithmetic.

The Basic Principle of Measurement

To understand the principle of measurement one must be aware of some simple, fundamental facts about radio waves. They travel

through air at a constant speed of about 186,000 miles per second (about 1000 feet in one millionth of a second), and they can be generated with absolute accuracy at frequencies as high as 10 megacycles (10 million cycles per second). A "cycle" is one complete wave, and it can be represented on paper by a sine wave (see Fig 2). For mathematical purposes a sine wave is divided along the horizontal centre line into 360 deg, as shown.

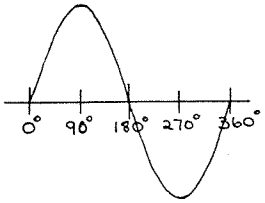


Figure 2

The principle of the measuring system is that a continuous train of waves of the measuring frequency is transmitted from the Master station, reflected back to the Master by the Remote station, and 'phase compared' with the wave leaving the Master station. Fig 3, and the accompanying explanation, illustrates this principle in detail. 'M' represents the Master station, 'R' the Remote station.

At (a) the first half-cycle of the measuring frequency wave is shown leaving the Master station, and in (b) and (c) it is shown travelling across the space between M and R.

At (d) the 0 deg point on the transmitted wave has reached R, and at this precise instant, the wave leaving M is at the 170 deg point.

The wave is now reflected back from R towards M, and at (e) the 0 deg point is shown after reflection as the wave travels back towards M. Its progress is shown in (f) and (g).

At (h) the 0 deg point on the reflected wave is shown having reached M, and at this precise instant, the wave leaving M is at the 340 deg point.

It follows that since all the cycles of this waveform are identical, each time a 0 deg point on the reflected wave arrives at M, the wave leaving M will be at the 340 deg point.

This comparison of the 0 deg point on the reflected wave with the wave leaving M is called "phase comparison".

Visual Indication System

The visual indication of this phase comparison appears on the CRT at the Master station, as shown in Fig 4. Since a sine wave can

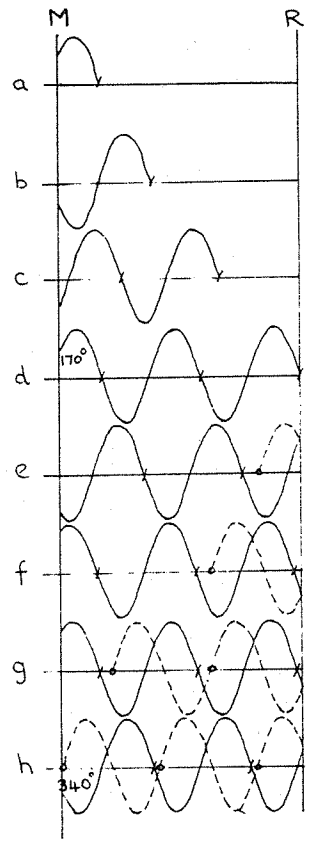


Figure 3

be divided into 360 deg, one cycle of the transmitted wave can be represented by a circle. This is precisely what is done, electronically, on the CRT at the Master station, 0 deg on the circle being coincident with the 0 deg point on the transmitted wave. The 0 deg point on the reflected wave, when it arrives at the Master station, is converted into a pulse which causes a 'break' in the circle, in this case at the 340 deg point, as shown in Fig 4. However, the face of the CRT is graduated into 100 divisions, so that the 'break' is read not as 340 deg, but as 94.

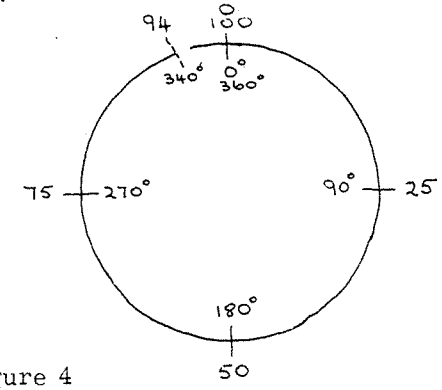


Figure 4

Frequency Designation	Frequency	Period	1 Division on CRT
A	10 megacycles	100 mu secs	1 mu sec
A - D	1 megacycle	1000 mu secs	10 mu secs
A - C	100 kilocycles	10,000 mu secs	100 mu secs
A - B	10 kilocycles	100,000 mu secs	1000 mu secs

(Megacycle – million cycles: kilocycle – thousand cycles: mu sec – milli-microsecond)

Table 1

As long as the stations remain the same distance apart, and the same frequency is used, the 'break' will occur in the same place; but if the distance or the frequency is changed, then the position of the 'break' will change. Using Fig 2 as a guide, make a template and try it yourself!

The Calculation of the Distance

To measure any distance, readings are taken at the four separate measuring frequencies using the above phase comparison system. The readings are combined in a final 'read-out' figure which represents the distance in TIME, measured in milli-microseconds, or thousand-millionths of a second. By simple multiplication, using the applicable multiplication factor, this figure can then be converted into feet, yards, metres, or whatever unit is required.

The four measuring frequencies used are listed in Table 1. Using these frequencies, the readings for a distance of 6197 feet would be:

A +	94	A - C	24
A - D	39	A - B	12

(Remember that the figures indicate the phase comparison at the different frequencies).

The combined 'time read-out' figure is made up from these readings as follows:

a. The A + reading provides the correct 10's and unit digits of the time read-out figure, ie, 94 mu secs.

b. The A - D reading provides the correct 100's and the approximate 10's digits, ie, 390 mu secs.

c. The A - C reading provides the correct 1000's and the approximate 100's digits, ie, 2400 mu secs.

d. The A - B reading provides the correct 10,000's and the approximate 1000's digits, ie, 12,000 mu secs.

e. Collecting the underlined figures together, the correct read-out is: 12,394 mu secs.

The conversion factor required to convert the 'time read-out' figure into the distance in feet is approximately .5. The distance is therefore:

12394 x .5 = 6197 feet.

The maximum 'time read-out' figure which can be obtained is 99,999 mu secs, which is equal to 10 miles. The operator must, therefore, know the distance he is measuring to within 10 miles, as the 'read-out' would be exactly the same for 9 miles, 19 miles, 29 miles, etc, etc.

Conclusion

Though the electronic principles used in the Tellurometer are complex, it is, in fact, a relatively simple equipment to use. The operators require no electronics knowledge, and with very little practice they can complete a measurement within 20 minutes of arriving on location.

The speed of operation, the fact that distances up to 30 miles can be measured with ease (90 miles only under ideal conditions), and the fact that the instruments can be easily carried by personnel, vehicles or helicopters, make this a useful and versatile equipment for military use, and a great improvement over the optical and mechanical measuring devices formerly used.

Note: For simplicity, the conversion factor to convert the time read-out figure into the distance in feet was stated to be .5. The accurate figure is .4917856.

HOW TO PASS the PRE-GROUP 4 ASSESSMENT

By Capt RDL Connell, CD

So you're going to try the assessment? Let's stop and think about how you can get the most marks (or knowledge) with the least amount of effort. This, after all, is efficiency.

Would you agree that a man who knows his job can do the job much more quickly than one who does not? This sounds like common sense. Is not the studying for an examination a race against time, and is not studying just another job? Why not then find out the best way to do that job. Surveys have been made in both military and civilian spheres to analyze the study methods of successful candidates. They all agree that a thorough knowledge of the subject results from an effective approach to:

Motivation
Organization of Study
Methods of Study
Methods of Writing Examinations

Most failures are due to ignorance or disregard for one or more of these essential phases, NOT inferior mental equipment. Let us look at each of these phases in turn.

Motivation

Motivation is the impelling power which induces a person to act. Most of us are opposed to change, and changing to a more efficient study method requires strong motivation. The Pre-Group 4 assessment looks like an insurmountable task. One of the first steps then, is to break it up into digestible-size bites. It is easier to have strong motivation towards a short subject than to the overall program. Secondly, an aim must be to retain knowledge, not just pass exams. Whilst not readily obvious, the subject matter is required or it would not be there. Some of the subject matter will be used to sharpen the ability to make decisions quickly, even though the actual question on the examination paper may not present itself in everyday work. Next, motivation is produced by the possibility of promotion and financial gain. It pays to actually calculate the expected benefits in pay and pensions compared to remaining at your present rank for the rest of your days. The figure is astounding, disregarding any general pay increase which may possibly occur. Finally, how will you ever know if you have reached your limit if you don't at least 'take a reading'. Compared to what's at stake the effort is really worth while.

Organization of Study

After a strong motivation has been established, study must be organized to a schedule. It is noted here that the best candidates are those with the heaviest workload. They are forced to budget their time. The budgeting of time (as will be seen later) is, in effect, planning one's time so that the probable gain in marks on the final examination is the same for each hour spent studying. That is, time is not wasted on a subject already learned, at the expense of gaining new valuable information. A carefully planned schedule allows time for study and normal activities. (No sense passing the assessment if HER lawyer hands you a divorce judgement the same day). A day-to-day habit is easier to become accustomed to, rather than an isolated study period crammed into a leave period. It may be desired to use some leave for a review period, but cramming does not, in the main, produce satisfactory results.

Your place of study must be free from distractions. Make it the same place every day, in an isolated part of the house if possible. Solve all your personal problems before settling down to study. Try to get a desk or table to be used for study only, and place it against a blank wall. When starting a study period, get all the study material together before the appointed time. Do all your administration in your own time, not in scheduled valuable study time.

Time spent in gathering paper, pens, etc, will gain no marks on the exam.

The next step is to survey the time available. This has nothing to do with the time required to bring yourself up to the required standard – that comes later. Find out the date of the exam, and count the weeks available. Deduct the weeks not suitable – temporary duty, annual leave, Christmas, or courses. Allow one to two weeks for planning your study program. Now estimate the hours of study that you can do comfortably each week.

This is done by doing a day-to-day, hour-by-hour survey. It's surprising how much time is actually available. The selection of what times to use is an individual matter, but the important thing is to plan regular hours each day, when you are unlikely to be overtired from other work. Some persons prefer the early morning hours or after midnight when the children have gone to bed. In any case do not plan long unbroken periods – never continuously for longer than two hours.

You may wish to take advantage of brief slack intervals in daily routine. At the start plan 30 to 45 minute spurts with 5 to 10 minutes rest. Then gradually lengthen the period until you get used to the routine of studying. This initial allotment of time should of course, be subject to modification after a trial period. A careful allotment of time should not result in any drastic curtailment of normal activities.

The carefully planned timetable simply ensures that each activity gets its fair share of the time available. When you have figured out how many hours your week gives you (the average is about 10 hours per week) then multiply by the available weeks and this is the total hours available for study.

Now you must determine how long the study will take to bring yourself to the required standard. Do not attempt to relate this to the time available above. These are two separate items and you are attempting to see what relationship they have to one another, if any.

Do an overall survey, one subject at a time. Go over the study material, chapter by chapter, make lists of headings and sub headings, noting the contents of graphs or illustrations which may take a while to understand. Estimate the time in minutes or hours for each chapter, being liberal in each case. Sample a chapter here and there after estimating. This will adjust your tendency to over- or under-estimate. Then add 100 per cent to the totals for recall and review. This total now gives the total required for each subject.

Total the time for all subjects and then add time for two major reviews at the end. Now, does it fit the time available? If not you must either increase your daily time or defer the examinations, do not make it fit. If your survey and sampling have been honest you are only kidding yourself that you can do it in less time and this will certainly result in disappointing failure. If it does fit then you are now prepared to think about a timetable.

The above surveys should have taken one to two weeks. This is not wasted time. You now have a clear idea of the scope of the task before you and you may come to the conclusion that it is possible to learn all this. You now approach the study with confidence and increased motivation.

A timetable is next. Keeping in mind the weeks not suitable, plan basic subjects and related subjects to run close together. Do not go through each subject one at a time – change is as good as a rest. Stop at natural breaks in the material, even at the expense of lengthening or shortening your time estimates slightly. Your day-to-day breakdown into a timetable should only be carried forward one month in advance.

Methods of Study

The actual study periods you have planned also need special attention. It is important to get down to work at the appointed time. Do not waste time daydreaming or getting into unrelated conversations. When this happens, all previous planning has become a waste of time.

Most of your learning will be from reading followed by practice problems. Attempt to understand the principles behind the subject. Do a general survey, then read actively – not as fiction. Look for the important words in each sentence; summarize what you have read. Read a paragraph – write a sentence, without looking back. Read a chapter – summarize by writing a paragraph. Make up lists of important points. Underline important points (only in your own books of course). This indicates important points and makes them stand out with each succeeding review. Try making up questions to bring out the subject matter. Finally look up the same idea in another book, not necessarily the one recommended. This will

present the material from a different point of view.

Frequent reviews or practice problems are important. These serve to keep the subject fresh; weak spots are discovered and you may be forced to go back to original material. Better to know your weak spots now than discover them during your final review.

Studying with others may or may not help. Two to four students is about right if you are suited for this type of study and can avoid drifting conversations. All can prepare questions and the explanation of difficult points will be a help to both the giver and the receiver as a review is given and a new point of view is received.

If for some reason a particular point cannot be understood on your own, put forward a reasonable effort, then give up, temporarily. Change to another subject or chapter. Then the next day ask others studying or your Workshop Officers. If this procedure is not followed because of a determination to 'see it through' valuable study time is being wasted when, sometimes, a simple correction of a misinterpreted point may set you straight. You are not studying when you are just fighting the problem.

Writing the Examination

After the required time has been spent on honest studying and the reviews are complete, then comes the examination. Again we can benefit by looking at the methods of writing examinations by successful candidates. Starting with a given amount of knowledge, marks can be lost or gained on an exam depending on the method used and the approach. The maximum amount of marks to be gained are influenced by two prominent factors. You are working against time and you will not know all parts of the subject equally well.

If one sits down and answers the questions in the order given one is almost sure to lose some possible marks. The paper must be read over quickly and the easiest questions done first. Ignore the value of each question at this stage. Renumber the questions to suit yourself, easiest first, hardest last. Then, when the easiest question is done first, your mind is set at ease and some of the tense atmosphere of the examination disappears. If you do them in the order they appear and No 1 question on the Paper happens to be difficult for you, this will only falsely add to an already tense situation.

The more detailed 'planning' of the action of writing an examination is the battle against time. Most of this can be done before entering the examination room. The duration of the exam and the total marks (usually 100) are often known beforehand. Allow a short period at the beginning for quick planning and a short period at the end for review. For example, a one hour exam worth 100 marks can be divided into 5 minutes planning, 50 minutes work, and 5 minutes review. This means that you must work at the rate of 2 marks per minute. Suppose the exam started at 1330 hours. The left hand margin might then look something like this.

Marks	Your Timing	Your Order	Question No
10	1401 - 1406	(4)	1
25	1406 - 1419	(5)	2
15	1335 - 1342	(1)	3 *
34	1344 - 1401	(3)	4
12	1419 - 1425	(6)	5 **
4	1342 - 1344	(2)	6

* (Easiest Question)
** (Hardest Question)

Note that where the mark allotment 'does not fit' the easier question (number 3) is shortchanged on time. Practice your planning on writing previous examinations to become familiar with this method.

When the alloted time for each question has elapsed, stop working on that question, leave a space, and go on. You make marks at the fastest rate in the early part of the question. As you go on, and your obvious facts are put down, you then make marks at a slower rate. It follows very simply then that the allocation of time to each question should be rigidly adhered to. If there is time at the end, and there very well may be, having put down all you can possibly squeeze out about that last difficult question, then go back and complete the unfinished questions, still in order of the easiest questions first.

In the review, check for obvious errors, and ask yourself "Have I given what was asked for?" If the answer is "Yes" then go on to the next question.

Minor points on writing examinations are to use the left side of the page for all rough

work and leave it there. If you make a patent error in the problem, the marker may sort it out from your rough work. This adds marks at no expense. If you cannot understand the question or it is poorly written (as sometimes happens) you may have to make an assumption. If you do, put down what assumption you are making, and answer the question on that basis. It may earn you marks.

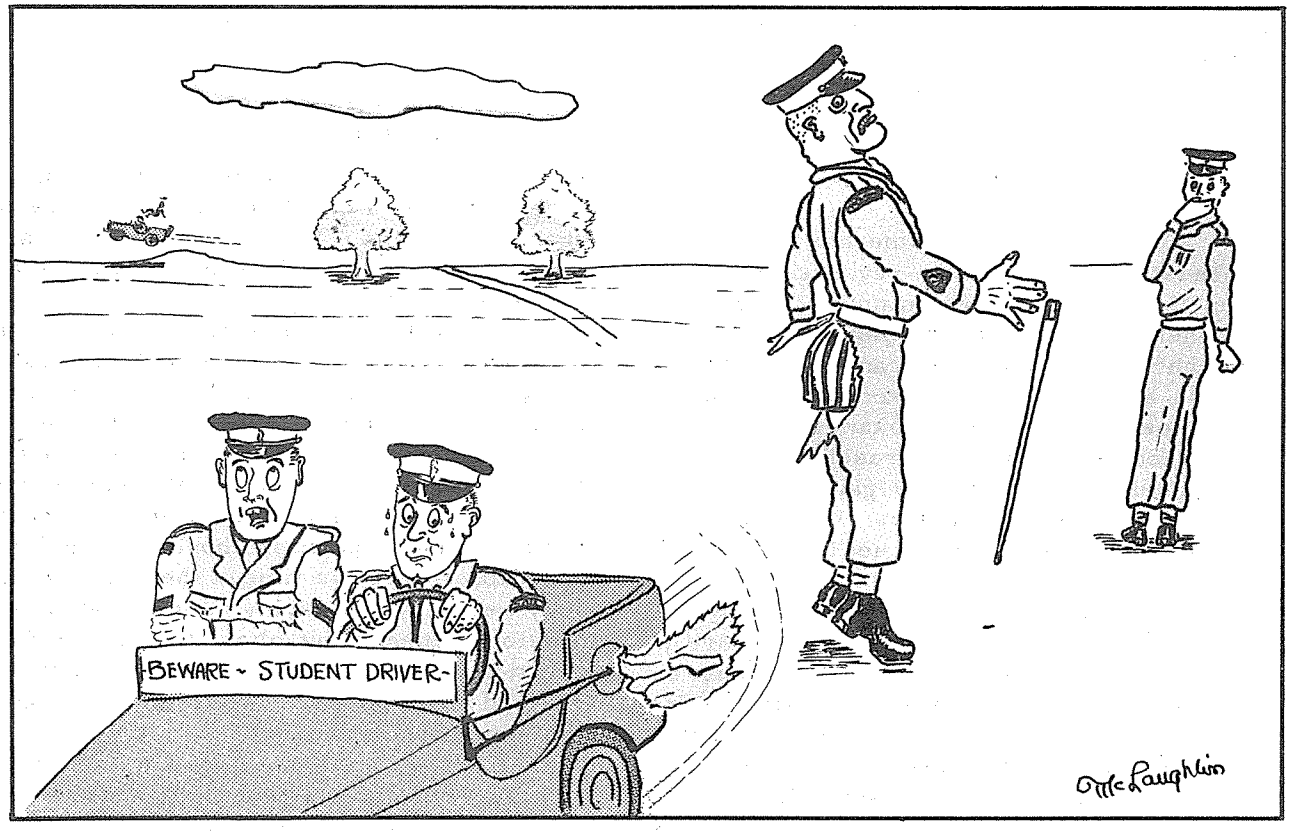
Summary

A successful program then, based on the experience of past successful students, is one based on strong motivation, organized study developed into a daily habit and isolated from distraction, and a survey of the study material to answer the all important question – will the time available fit the time required? If not, there are two alternatives, increase the time available or defer the examination. Study must be for the full period with no interruptions. At exam time, marks can be gained by doing the easiest questions first, dividing the time according to the marks and reviewing the work.

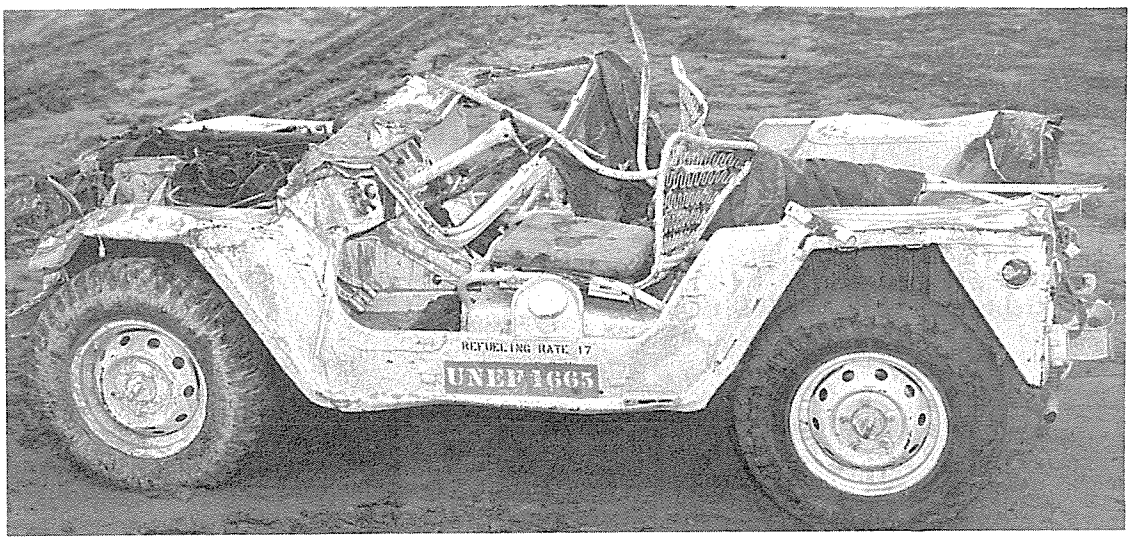
Congratulations! You just passed the Pre-Group 4 assessment.

NOTE: The above material was taken mainly from CAMT 2-85 "How to Qualify for Promotion and Staff Courses" and re-written to apply to NCOs writing the pre-group 4 assessment.

How NOT to Pass your Driver's Test



AVOID DRIVING TOO CLOSE TO PEDESTRIANS — CAN'T TELL WHAT KIND OF ACCIDENT IT MIGHT LEAD TO--



By Capt TM Mimee

This was an M-151 American 4 x 4 jeep, with a mileage of roughly 1000 miles. It was not in a collision or similar situation.

The damage was due to WATER and the story goes as follows.

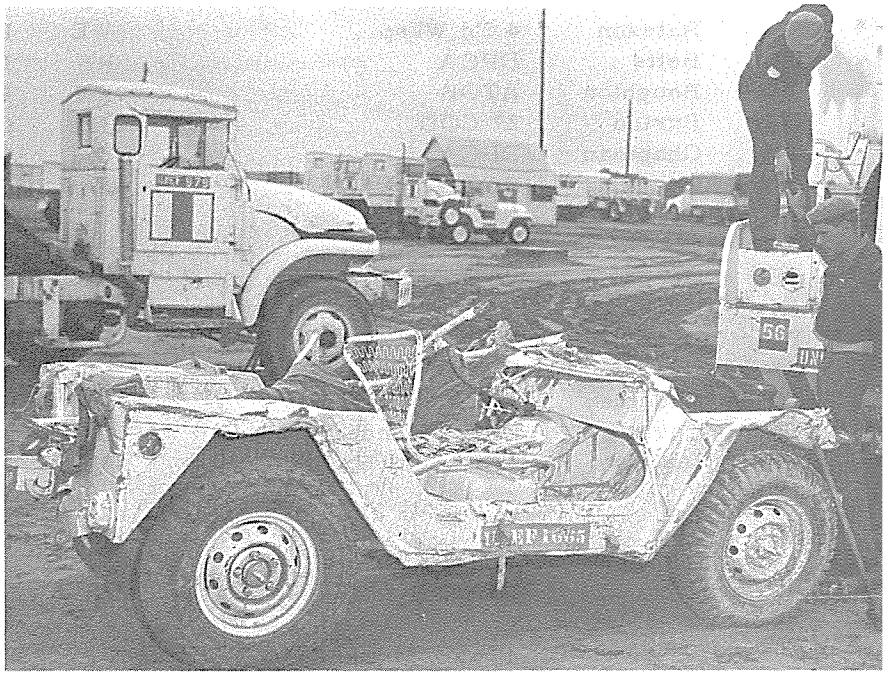
Last week we had a terrific rain storm and when the rain falls here it comes down in buckets. There are no river beds in the true sense of the word – they have stream beds or Wadies, "... dry except in the rainy season." (Webster)

The occupants of the vehicle were Jugoslavs, a major in the front seat driving, a lieutenant in the rear. They apparently were in the wadi when suddenly a 9-foot torrent of water descended upon them. The major saw it first and made for high ground. He made it. The lieutenant also made it but not before getting a good soaking. He was lucky.

Meanwhile the jeep took off and the tale becomes bizarre and perhaps could be construed as imagination. This vehicle turned over and over like an acrobat doing handstands and back and front flips.

From this two tales emerge. The first from a Jugoslav lieutenant who said they finally found the vehicle 3 miles or kilometers downstream. The second tale had it that it was 300 yards downstream. But the hood was never found nor was the spare tire. The vehicle is written off but we will salvage as many parts as possible or cannibalize – to put it another way.

The engine is now apart with sand everywhere. We have two cracked piston skirts which we cannot find a logical reason for.



The recovery vehicle is a Bedford 4 x 4 with a hand-operated winch. Cfn BW Mahoney is the person whose face you can see, the other is Cfn HG MacIntosh. Beside Mahoney note the sledgehammer. Suggest the caption read "This is how 56 Cdn Inf Wksp Middle East repairs its vehicles. How's that for sledgehammer work".

-TMM

who's where

BRIGADIERS

KH	McKibbin	Comd HQ West Ont Area

COLONELS

WS	Hunt	Camp Shilo	GW	Thompson	202 Base Wksp
EC	Mayhew	AEEE	KR	Ward	RCEME School
A	Mendelsohn	DEME			

LIEUTENANT COLONELS

VW	Bethel	DSEO	GT	Kirk	27 COD
GW	Bruce	DEME	AHR	Lewis	DDA
DA	Campbell	DEME	AGM	Maitland	Cdn Delegation MAS (CALE)
DG	Carlyle	DEME			
GG	Cavaghan	D Pers	AL	Maclean	DEME
HL	Cohen	AEEE	JH	MacLean	AEEE
KF	Collins	AEEE	WJ	Owens	DEE
JC	Currie	RMC of S	CG	Provan	CASC
WH	Glover	Comd EME Eascom	AM	Reid	DTRAM
H	Goodfellow	Comd EME Wescom	ANP	Roberts	DEME
WG	Hamilton	Comd EME Cencom	HM	Robinson	Comd EME Quecom
RHC	Hodgson	27 COD	FJ	Sergi	NATO Armt Committee
EC	Ilott	AEEE	JP	Sherren	DEME
			DJ	Tidy	DEE

MAJORS

J	Adams	202 Base Wksp	BM	Diebert	14 Coy
BE	Babcock	27 COD	FL	Demone	6 Coy
P	Bateson	4 Fd Wksp	WE	Ellis	3 Coy
CH	Betts	DPCA	RF	Fendick	RCEME School
JC	Boughton	ATOB	DH	Fraser	2 Fd Wksp
GR	Burton	27 COD	JJ	Garnett	7 Coy
FW	Chapman	DPCA	DV	Geary	CALE
HW	Chapman	RCEME School	SA	Girdler	DEME
JF	Clarabut	HO Cencom	WJN	Haggins	CJATC
BC	Clerke	DEME	DV	Hampson	DRB Ralston, Alta
FE	Cooper	13 Coy	HV	Hann	202 Base Wksp
JN	Courtney	CAS (W)	TR	Heal	27 COD
BB	Cox	8 Coy	CB	Hellyer	CAORE
EB	Creber	DOSR	EF	Hendricks	DEME
JJE	Cuddihey	202 Base Wksp	HW	House	DEME
DH	Curling	DRB Defence Systems	CA	Hurst	CALE
LA	Daviss	RCEME School	AJ	Jeffery	202 Base Wksp

MAJORS

FG	Johnson	10 Coy
EG	Jones	RCEME School
KR	Joslin	13 Coy
FR	Kaye	HQ Wescom
KT	Kennah	DMM
VD	Kenyon	2 Coy
HLM	King	AEEE
CG	Lawrence	DEME
JW	Lelacheur	DEE
RW	Libbey	DTRAM
JL	Loughridge	1 Coy
LH	Love	CALE
RL	MacDonald	27 COD
ALD	Macdonnell	1 Fd Wksp
AJ	MacGillivray	RCEME School
RH	MacLeod	CADEE
JD	McDougall	DEE
RL	McIntosh	CADEE
RA	McKay-Keenan	DRB
MD	McKinlay	DEME
HE	McLaughlin	DEME
CR	Morgan	5 Coy
DR	Mowbray	DEME
DA	Nicholson	HQ Eascom
PH	North	CALE
GL	O'Brien	CAS (W)
R	Peters	DEME
HCR	Pfeiffer	Detroit Arsenals
JN	Pinder Moss	AEEE
HA	Popkin	202 Base Wksp
CG	Racicot	HQ Quecom
W	Rhodes	AEEE
RC	Rivers	4 Coy
M	Ruscher	DOSR
LA	Sainsbury	DEE
DA	Saunders	RCEME School
GD	Savage	11 Coy
IC	Scarlett	DEE
RN	Shaw	EBS Bn
WR	Shaw	DEME
JO	Sheehan	DA Eng
WD	Sneddon	RCEME School
WG	Svab	HQ CBUE Incr "A"
AR	Thomsen	RCEME School
JM	Treleaven	DME
JD	Trevithick	AEEE
PA	Tuck	CAS(W)
RW	Vollett	CAS(W)
EA	Williams	CALE
WR	Willing	56 Cdn Inf Wksp
GA	Wright	DEE
B	Yarymowich	HQ CBUE DADEME

CAPTAINS

AM	Adams	1 RCR
KI	Anderson	RCEME School
LW	Armstrong	2 Coy
NE	Birchard	DEME
JMF	Bourassa	CALE (RMC of S)
GN	Brent	DEME
JE	Brewster	11 Coy
JE	Brown	AMC Rockcliffe
PL	Burcombe	202 Base Wksp
FJ	Burton	DEME
CO	Bush	RCEME School
LN	Bydal	CAS(W) Redstone Arsenal
JL	Calvert	1 Fd Wksp
JNR	Campbell	6 Coy
WM	Campbell	CASC
AB	Cantlon	4 Tpt Coy RCASC
FR	Carruthers	RCEME School
G	Charles	56 Cdn Inf Wksp
TM	Chell	CAS (W)
JE	Coates	3 Coy
RDL	Connell	CJATC
JH	Cooper	CJATC
DH	Cumming	RCEME School
PR	Dack	RCEME School
JD	Delaney	14 Coy
FF	Doherty	DEME
JGR	Doucet	5 Coy
OA	Edmond	27 COD
AS	Etter	8 Coy
RJ	Francis	7 Coy
AM	Gilbert	DEME
FB	Goring	1 Coy
RE	Goulding	CASC
NA	Graham	4 Fd Wksp
PM	Graye	FGH
GE	Grainger	AEEE
JR	Griffin	202 Base Wksp
WJA	Groom	DEME
PEV	Hansen	CADEE
RT	Hare	11 Coy
JH	Hayward	RCD
HJ	Hellard	HQ CC Cyprus
DV	Hill	1 Tpt Coy RCASC
FA	Hlohovsky	CALE (RMC of S)
O	Howard	202 Base Wksp
FG	Hutson	4 Fd Wksp

CAPTAINS

WR	Hyman	CALE (RMC of S)
ID	Isbester	EBS Bn
AF	Johannes	8 CH
MC	Johnston	4 Fd Wksp
JJ	Kane	4 Coy
JR	Kaye	13 Coy
GW	Keays	PPCLI
JJ	Klinec	DEME
NE	Laviolette	HQ 4 CIBG (BEME)
WF	Lucano	RCEME School
AM	MacDonald	2 Fd Wksp
JA	MacDonald	RCEME School
RMG	MacKenzie	2 Tpt Coy RCASC
E	MacMillan	3 Coy
GE	Maguire	EBS Bn
DM	Maher	10 Coy
MG	Masuda	EBS Bn
GD	McCulloch	2 RHC
AL	McEachern	EBS Bn
CA	Millar	11 Coy
HJ	Millen	13 Coy
RW	Miller	3 RCHA
TME	Mimee	56 Cdn Inf Wksp
HG	Morgan	HQ CBUE
JL	Moyse	27 COD
PB	Nicholson	CASC
WH	Norton	DPCA
JF	O'Connor	202 Base Wksp
JR	O'Neill	DEME
FA	Ouimet	DEME
TW	Oxley	HQ BC Area
CA	Penny	CJATC
DB	Perrin	2 RCHA
WC	Perry	56 Cdn Inf Wksp
PP	Pospisil	1 RCHA
CH	Putt	DEME
RH	Purton	DCER
JR	Raby	AEEE
JA	Richards	RCEME School
HL	Robinson	3 Coy
EA	Rochefort	4 Fd Wksp
V	Roddick	13 Coy
GS	Rippengale	11 Coy
HA	Rosson	DEME
WGL	Russell	202 Base Wksp
RB	Screaton	CASC
WJ	Shearing	DEME
WRL	Springford	CJATC
JA	Stott	10 Coy
GW	Swallow	DEME
RH	Thorn	RCEME School
WA	Thomas	RCEME School
DE	Wilson	CAS (W)

LIEUTENANTS

JFJ	Allaire	4 Coy
GW	Anscomb	RCEME School
JH	Armstrong	LdSH (RC)
KD	Baird	RCEME School
JLS	Belisle	RCEME School
RE	Betzner	RCEME School
JF	Boudreau	RCEME School
W	Boychuk	4 Fd Wksp
R	Boyko	10 Coy
FN	Brodie	7 Coy
RP	Britt	RCEME School
HD	Byer	LdSH (RC)
PJA	Charlebois	202 Base Wksp
CA	Churchill	AEEE
DL	Clarke	14 Coy
BL	Code	RCEME School
RF	Conway	HQ Wescom
JGD	Crookston	AMC Rockcliffe
JS	Davies	HQ CBUE
RE	DeLeeuw	2 Fd Wksp
DG	Dinsmore	RCEME School
JA	Dixon	EBS Bn
JP	Durocher	5 Coy
HT	Edworthy	RCEME School
RN	Fischer	7 Coy
JJ	Fyfe	RCEME School
MJJR	Giroux	5 Coy
GWE	Godson	202 Base Wksp
GT	Hammond	DPCS
TW	Healy	HQ Cencom
KW	Henderson	DEME
JI	Hanson	10 Coy
LM	Harvey	202 Base Wksp
DC	Kaufman	27 COD
HG	Kayne	202 Base Wksp
WW	Laird	8 Coy
FH	Leach	1 Tpt Hel Pl RCASC
JLRL	Langevin	8 Coy
JPA	Leger	2 Fd Wksp
FG	Legg	HQ Sask Area
LA	Leflar	4 Fd Wksp
JPR	Levesque	2 Fd Wksp
JW	Lowthian	3 Coy
EB	MacLellan	DEME

LIEUTENANTS

GK	Maguire	DEME	JGHL	Roy	1 Fd Wksp
RB	Manning	CJATC	AG	Rose	13 Coy
AE	Marble	RCEME School	J	Sanders	RCEME School
HP	Martel	202 Base Wksp	RH	Seguin	RCEME School
WR	McCaughan	HQ Eascom	BH	Simms	13 Coy
JG	Meek	10 Coy	GE	Smith	AEEE
RG	Patterson	EBS Bn	GG	Stewart	1 Fd Wksp
LF	McLeod	HQ Wescom	VB	Suddaby	11 Coy (214 Wksp)
DD	Nikiforuk	1 Fd Wksp	JK	Spackman	RCEME School
PG	Pothier	HQ CBUE	DL	Smith	RCD
NE	Pothier	1 Pers Depot (NSTC)	JT	Thompson	FGH
CF	Potter	1 Fd Wksp	AD	Tupper	27 COD
GA	Riley	10 Coy	RL	Walker	202 Base Wksp
HG	Ray	DEME	B	Wong	202 Base Wksp
WD	Roche	56 Cdn Inf Wksp	JW	Warminton	3 Coy

SECOND LIEUTENANTS

JABR	Bouchard	RCEME School	MB	Taschereau	RCEME School
JDG	Choquette	5 Coy	JNJA	Turcotte	2 Fd Wksp
JJPR	Jobin	RCEME School	JEGA	Touchet	RCEME School
OS	Oishi	13 Coy	GMY	Pedneault	RCEME School
B	Tomlinson	13 Coy			

UK EXCHANGE OFFICERS

REME

Maj	JB Ingram Cotton	DEME	Maj	DT Tremeer	RCEME School

ROTP CADETS

J	Amyot	McGill	DD	Dorman	RMC
WD	Armstrong	RR	JCG	Dupont	CMR
NE	Austin	CMR	TJ	Enright	CMR
JT	Bart	RMC	RR	Fraser	RMC
JRMG	Beauregard	CMR	RJ	Ferguson	Toronto
RR	Bergeron	RR	AR	Gillis	St Francis Xavier
RG	Bell	RMC	CJ	Girard	CMR
JAR	Benoit	CMR	JPHY	Girard	CMR
JAP	Boucher	Laval	JPJ	Girard	CMR
R	Bouliane	CMR	PAR	Glynn	RR
JPA	Branchaud	CMR	BGS	Glendenning	NB
JJJ	Brousseau	CMR	JRA	Green	UBC
BP	Brown	Sir George William	RA	Green	RR
JJR	Carrier	CMR	EC	Hague	CMR
MAC	Campbell	NB	DR	Hamilton	RMC
FE	Collinge	CMR	LLA	Hellemans	McGill
PGG	Collinge	CMR	JEY	Kingsbury	RMC
JT	Cooper	Sask	RL	Langdon	Sir George William
HL	Corbett	CMR	JR	Lamb	Carleton
JPJ	Dagenais	CMR	JPR	Leblanc	Laval
GW	Davies	RR	JRA	Leblond	Ecole Poly

ROTP CADETS

J	Lessard	CMR	V	Pergat	McGill
JJM	Levasseur	CMR	JAM	Perreault	CMR
TF	Lydon	St Francis Xavier	JMB	Podesto	Laval
JJP	Marchildon	CMR	RV	Potter	CMR
JP	MacFarlane	NB	TR	Patterson	NB
PC	Marriner	Dalhousie	JAEJ	Roberge	CMR
RG	McKenna	St Francis Xavier	LFG	Scagnetti	Toronto
JCT	McWilliam	NB	HT	Simpson	Queens
HM	Merklinger	RMC	LP	Siwik	Western Ont
WA	Mersereau	NB	RF	Starzynski	McGill
JGG	Nappert	CMR	RGJ	St-Aubin	Assumption (Windsor)
JAN	Nault	CMR	TW	Strang	Alberta
A	Nellestyn	RMC	IJ	Taylor	Alberta
JC	O'Rourke	McGill	RG	Taylor	CMR
TJ	Panke	Manitoba	MKM	Trevors	NB
JLPJ	Paquette	RMC	GR	Walker	RR

"A Thing of Beauty ..."

At the wedding of Patricia Ann Shaw, daughter of WO1 JE Shaw, RCEME, to Lt John Fraser Webb, a ten-man guard of honor from the RCD formed an arch of crossed swords.

The scene is the RC Chapel at Camp Gagetown.

Technical Notes

The following technical notes, consisting entirely of General Motors of Canada Products Service Bulletins, are put in as back pages which may be removed for easy reference, if desired.

PROCEDURE FOR DIAGNOSING VIBRATION COMPLAINTS - 1964 All Passenger Cars

An increasing number of Product Information Reports on all car lines regarding vibration complaints has led to the preparation of this item. It will point out components which will contribute to vibrations and establish a systematic procedure for diagnosing the source of the vibration.

Today's precision engineered automobiles operate more quietly and are generally vibration free, compared to those of a few years past. With the quieter cars, any slight unbalance will result in a vibration which is annoying to some people.

It should be remembered that a vibration, whether it is one which can be felt or heard, can be sensed by some people and not by others. When working on a vibration complaint, therefore, determine that you are hearing or feeling the same vibration as the customer. This is why it is important, where practical, to road test the car with the customer.

A portable tachometer is perhaps the most important piece of equipment to be used when diagnosing vibration. Before the original road test is undertaken, be sure to connect the tachometer in order that you can determine whether the vibration is related to engine R.P.M. or road speed.

1. Initial Road Test With Customer

Select a length of road which is as smooth as possible and a road with the least amount of traffic possible. Avoid broken pavement, concrete surfaces with joints between sections.

Drive the car to determine at which road speed and engine R.P.M. the vibration(s) occurs. On the initial run, avoid any heavy acceleration but gradually increase speed. In this manner, it is possible to pick out vibrations easier, especially those of short duration (over a small R.P.M. and/or M.P.H. range). When the vibration or vibrations have been found, shift the transmission from Drive to Low range (automatic transmissions) or high to 2nd or 3rd (standard transmissions). This will determine if the vibration is related to engine R.P.M. or road speed (M.P.H.).

An out-of-balance vibration, which is usually a cycling vibration, will invariably occur at two or three speed ranges (either R.P.M. or M.P.H.), and the intensity of vibration will increase with increase in speed. For example, if a vibration occurs at 750 R.P.M., it can recur at 1500 R.P.M. with approximately double the intensity and again at 2250 R.P.M. with approximately three times the original intensity.

Before completing the road test, carry out one heavy acceleration from a standing start to determine if any shudder is evident from the drive line. Should any shudder be encountered, it is a good indication of incorrect pinion angle - pinion nose too high or too low relative to the centreline of the axle. Avoid spinning the wheels, as this will cause a tire problem.

2. Corrective Procedure

(a) Vibration At Particular Engine R.P.M. or R.P.M. Ranges

This type of vibration originates in the engine, its accessories, clutch or converter, depending on type of transmissions. It can be reproduced in the mechanic's stall by running up the engine to the critical R.P.M.(s). In some cases the transmission may be placed in Drive range for short periods of time if slight load is required to accentuate the vibration or roar.

The first and most important item is to determine that the engine is operating correctly by carrying out a good tune-up and setting all variables to Factory specifications.

Also ensure that the exhaust system is not the reason for the vibration. A "bound-up" exhaust system, or misaligned tail pipe will result in vibrations which can be both heard and felt. The entire exhaust system should be loosened off and then aligned so that no binding occurs and all the system hangers have an equal load. The joints should be tightened only sufficiently to prevent exhaust leaks. Secondly, check engine and transmission mounts to ensure they are in good condition and that none of the mount to frame and engine or transmission bolts are grounded. Loosen off the mount attaching bolts, jack up engine/transmission assembly, move to and fro to ensure that when the engine is lowered back into position the bolts centralize in their respective holes and no shear forces are applied to the mounts. Torque bolts to specifications.

Thirdly, eliminate engine accessories one at a time by disconnecting their "V" drive belts. By doing this, the generator, power steering pump, fan, water pump, fan shroud can be checked to determine if one or more are the cause of vibrations.

Note:- The engine must only be run for a short period with the water pump disconnected to avoid overheating.

If vibration is still present, then it is due to an unbalance condition in the engine, converter or clutch. This unbalance may be due to run-out in a rotating body. As the front of the engine is easily accessible, check the harmonic balancer to determine if it is tight on the crankshaft or has not moved on its hub due to the rubber insulating ring separating from either the hub or outer ring. (This would also lead to incorrect ignition timing on engines with this type of balancer.) To determine if the out-of-balance is at the front of the engine, place a piece of putty (approximately 1/2 ounce) on the inside edge of the crankshaft pulley. Mark original position, run engine to critical speed and determine if any improvement is made. If none, place putty 180° from original position and re-check. If necessary, move putty several times to find a position where a change in intensity occurs. For example, if at one position the vibration increases, place weight 180° from this point, then add or subtract weight to obtain the least possible vibration. At this point, determine weight necessary and with a suitable size of drill rod of the equivalent weight insert it into a balance pin hole in the harmonic balancer at the same location from which the lump of putty was removed.

Note: - Be sure rod is of sufficient press fit that it will not work itself out of the hole.

On a few occasions, it has been found that the flywheel with excessive lateral run-out will cause a vibration in the 25 - 40 M.P.H. range. Lateral run-out should not exceed .015" when measured at the converter mounting pads. It should not necessarily be assumed that the run-out is in the flywheel alone, it may be due to the flywheel to crankshaft bolts being unequally torqued, thus "cocking" the flywheel. Therefore, first loosen off the bolts and re-tighten each bolt equally, to pull the flywheel on the crankshaft base squarely until the specified torque is obtained.

An out-of-balance in the converter can, in some cases, be corrected by indexing it 120° relative to the crankshaft. In others it may be necessary to balance in a similar manner as the harmonic balancer by adding washers to the converter/flywheel bolts.

(b) Vibration at Particular Road Speed(s)

Car speed sensitive vibrations originate in chassis components other than engine or transmission converter. The highest percentage is due to tire and wheel assembly balance and/or radial or lateral run-out.

With car raised on jacks, using flat stands under axle housing, to its same relative position as when driven on the road, run the car in Drive at the critical speed. If the vibration is not present, then it is in the front suspension assembly or due to high radial run-out of the wheel-tire assembly. If the vibration remains, it has then been isolated to the driveline or to tire unbalance.

For front suspension or high radial run-out, first check run-out of all wheel and tire assemblies and obtain minimum run-out by rotating the tires on the wheels. Check front hub and drum assembly for static balance. If a large number of balance weights are present on the drum and it is still out of static balance, replace assembly.

Carry out a really accurate "on the car" balance, which should correct vibration due to tire balance.

Driveline vibration - where possible, check pinion angle and adjust to Factory specifications. In some cases it may be necessary to go away from specifications to eliminate driveline shudder.

Check for tight universal joints or overtorqued "U" joints. Check radial run-out on pinion flange and propeller shaft. If flange run-out exceeds .005", and propeller shaft run-out exceeds .015" front, .010" rear, index 180° to determine if run-out can be reduced. (If not, replace the defective part.)

Should the vibration remain, then attempt to balance the shaft with two suitable size hose clamps on the rear of the propeller shaft. This is best accomplished by the following procedure:

(i) Remove wheels and tires and rear brake drums.

Caution:- Place a block under brake pedal so brakes cannot be applied.

(ii) Install hose clamps (with heavy portions together) at rear of propeller shaft and operate car at critical speed. Mark position of hose clamps. It is possible to locate the heavy side of the shaft by holding a crayon or pencil close to the shaft while it is rotating (speedometer indicating 40 - 50 M.P.H.) and carefully bring the crayon upwards until it just contacts the rotating shaft. If carefully done, the heavy

side (point of maximum run-out) only will be marked by the crayon. 180° from this mark is a good starting point to locate the heads of the clamps.

(iii) Run the car at critical speed to determine if the vibration has been changed. If the vibration is gone, no further work is required.

(iv) If unbalance still exists rotate both hose clamp heads 180°. Run car again at critical speed to determine if there is a change in vibration. If worse, return clamp heads to the original position, as the combined weight of the two hose clamps was excessive. In order to reduce this excess, rotate the clamp heads away from each other 45°. Run car and note if unbalance has improved.

(v) Continue to rotate the clamps in small angular increments until the vibration is reduced to a minimum.

Note:- Do not run car on stands for extended periods due to the danger of overheating the transmission.

In some cases where none of the aforementioned corrective balancing procedures has effected an improvement, it will be necessary to replace the propeller shaft with a known good shaft. On some cars it may be beneficial to reduce the "U" joint angles by shimming the rear of the transmission or removing shims from the rear transmission mount. It may be necessary to go out of specifications.

After the vibration has been reduced to a minimum on stands, carry out a final road test to evaluate results, as they may be different due to tire contact with road surface and suspension movement.

Vibrations, due to their complexity, are not always possible to completely eliminate, but in the majority of cases can be reduced to an acceptable level which will bring the car to Factory standards.

****

In order to install the needle bearing on 1963 Trucks with 7000 pound front suspension, the following procedure should be applied:

1. Pack the assembly with #1 Multi-Purpose grease.

2. Make certain that the needle bearing can be installed easily and will not have to be forced between the yoke and I-beam.

3. In cases the needle bearing will not go in easily, lightly file the I-beam on the top portion until the desired clearance is obtained.

4. Check the clearance between the upper knuckle yoke and the top of the front axle centre, as shown in Fig 14. Specifications call for a maximum tolerance of .005". If this specification is exceeded, use shim, part #3819399, as required.

****

HIGH GEAR HOP-OUT UNDER ROUGH ROAD OPERATION - 1960-64 Series 50 and 60 Trucks Equipped With 4-Speed Transmission

A few complaints have been received from the Field concerning high gear hop-out on rough roads on the above series Trucks equipped with 4-speed transmissions.

This condition, caused by gearshift lever shake, has been corrected in Production by the use of new gearshift levers, which are 2 1/2" shorter and incorporate longer lower ball ends to improve shift lever to shifter yoke fit.

The new levers may be used in Service to correct complaints of high gear hop-out on the subject vehicles. The following is a list of the old and new part numbers and the vehicle identification numbers when the new parts entered Production.

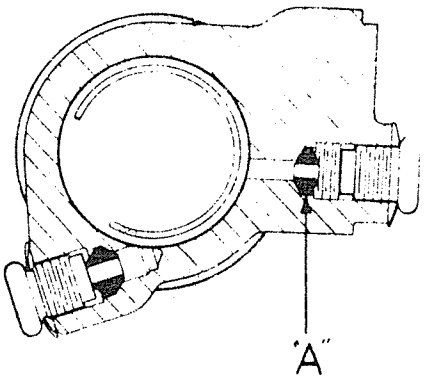
New Part Number	Old Part Number	Models	Vehicle Identification Number
3858583	3766513	C50-60 Cowl Models S50-60	4S6202619505E
3858585	3765471	All C50 Cabs; C60 Cabs With 6-Cylinder Engine M60	4C5303616800C 4M6503650950G
3858587	3816782	C60 Cabs With 8-Cylinder Engine M60	4C68303820267E Did not enter

****

LOWER REAR WHEEL BRAKE CYLINDER REVISED - 1963-65 Series 50-60 Trucks (Chevrolet)

When installing a Service lower rear wheel brake cylinder, part #5454314, on the above series vehicles, the input fitting hole should be checked for the presence of a brass insert, shown in Fig 1. If the insert is present, the wheel cylinder may be installed, using the original equipment brake pipe fitting.

If the wheel cylinder does not have a brass insert, it is the latest Service replacement cylinder, and will require the use of one brass washer, part #231343, and one special fitting, part #497752, in order to connect the cylinder to the original equipment brake pipe fitting.



****

ENGINE FLYWHEEL ATTACHING BOLTS LOOSENING - 1964 Series 10 Through 60 Equipped With 230 and 292 Cubic Inch Engines

A few cases of flywheel attaching bolts loosening have been reported from the Field on the above series Trucks. In order to eliminate this complaint, the flywheel attaching bolt torque has been increased to 60-70 ft lbs.

The increased bolt torque entered Production at 230 cubic inch engine #804159072 and at 292 cubic inch engine #304405778.

BRAKE MASTER CYLINDER COVER LEAKAGE - All 1960-64 Series 10-80 Trucks Equipped With Rectangular Master Cylinder

This item supersedes the information published on Page 48 and provides instructions for a modification that is recommended to avert brake fluid leakage from the rectangular cover used on the brake master cylinder of many 1960-64 Trucks. Repeated checking of the brake fluid level has been found to pull the centre of the cover gasket upward, due to attachment of the gasket retainer to the cover bolt, at the under side of the gasket. Upward movement of the retainer reduces the gasket sealing at the edge and also forms a fluid trap above the gasket, which can result in considerable leakage of fluid out the air vent.

To insure that proper gasket positioning is maintained so that brake fluid will not be trapped above the gasket, an additional retainer should be installed on the cover bolt, as described below and shown in Fig 57.

The original retainer and gasket can be removed by sliding the cover down and off the bolt. Procure an additional retainer, part #9414220, and install on the bolt, positioned 5/8" from the underside of the cover. Install cover gasket, part #5465109 (rubber), against the added retainer and use the original retainer underneath to hold the gasket in place. This will position the centre of the gasket about 1/8" below the clamping edge of the cover. Assemble the cover to the master cylinder and torque the cover bolt to approximately 45 in lbs. Do not over-torque as it could cause deflection of the cover and result in fluid leakage.

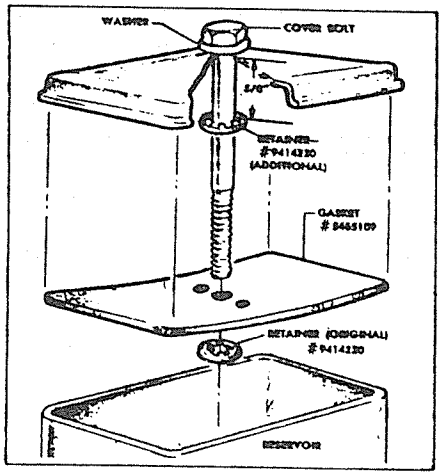


Fig 57.

****

AXLE LUBRICANT LEAKAGE FROM REAR WHEEL SEALS - 1963-64 Series 60 Trucks Equipped With 17,000 Pound Corporation Axle

If axle lubricant leakage at the rear wheels is experienced on the subject vehicles, it may be due to use of an incorrect inner rear wheel bearing.

In order to determine if an incorrect bearing has been installed, the inner bearing race and roller assembly should be removed from the wheel and installed on the axle spindle. The correct bearing will be a slip fit on the spindle; incorrect bearings will have excessive clearance.

The correct bearing inner race and roller assembly is part #457352.

****

CYLINDER HEAD GASKET FAILURES - 1963 - 64 Series Trucks 10 Through 60 Equipped With 230 and 292 Engines

In order to eliminate cylinder head gasket failures on the above series vehicles, a new composite steel-asbestos head gasket, part #3869196, has been released for service replacement.

When installing the new gasket, all cylinder head bolts should be re-torqued to 90-95 ft lbs after the engine has thoroughly warmed up.

DISTRIBUTOR REVISED TO INCORPORATE SHOCK MOUNTED DRIVE GEAR - 1964 Series 60 and 80 Equipped With 327, 348 And 409 Cubic Inch Engines

In order to eliminate excessive wear in the spinner governor and distributor advance mechanism on the above series Trucks, a new distributor incorporating a shock mounted drive gear is being used in Production. The shock mounting is accomplished by cushioning the drive gear from the distributor shaft by rubber, as shown in Fig 56.

To provide for this rubber cushioning, the drive gear shank was enlarged and made longer. This increased gear assembly size requires a larger distributor mounting hole in the cylinder block, as well as a new intermediate oil pump shaft.

The new distributor is not interchangeable with the old design, due to the larger distributor mounting hole required in the cylinder block. New partial engines and fitted blocks will be released shortly with enlarged mounting holes to accept both distributor designs.

Following a list of the part numbers of the old and new type distributors:

Engine Type	Old Distributor Part Number	New Distributor Part Number
327 Cubic Inch	1112765	1112795
348 Cubic Inch	1112786	1112796
409 Cubic Inch	1112767	1112797

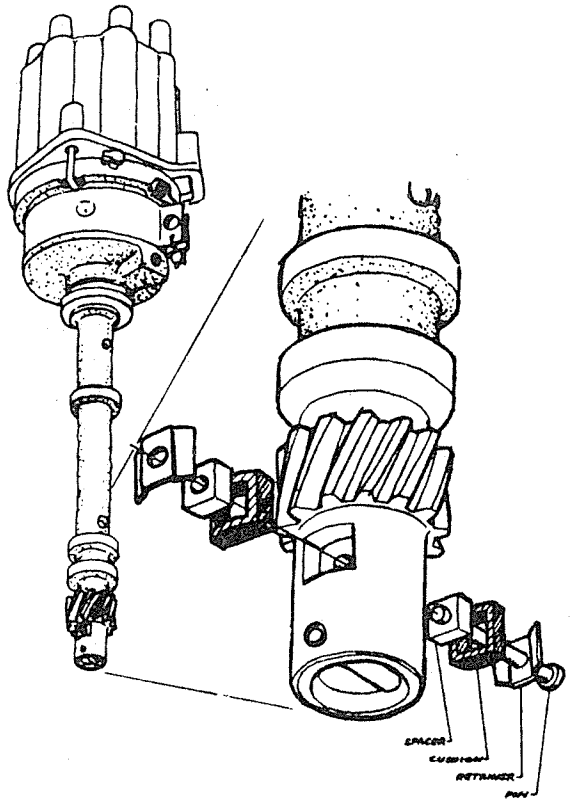


Fig 56

****

GM DIESEL ENGINES, ALL SERIES

Torque and Lubrication, Cylinder Head and Main Bearing Cap Bolts and Nuts

Some misunderstandings exist about the proper tightening and the use of a lubricant when installing cylinder head and crankshaft main bearing cap nuts and bolts.

When tightening a nut or bolt to the proper torque it is important to understand that it is the amount of tension (stretch) set up in the bolt or stud and not the amount of torque applied that holds the pieces together. If the bolt tension does not exceed the dynamic load, regardless of the amount of torque, the joint will loosen and failure from fatique may eventually result.

On all GM Diesel engine cylinder head and main bearing bolts and nuts, satisfactory results can be obtained with 3GP365 engine oil. Apply the oil to the bolt and stud threads and on the bolt head and contact areas. Tighten to the high side of the torque specifications.

The proper lubricant aids in overcoming friction and makes it possible to obtain the right amount of tension. The excessive amount of tension resulting from the use of some lubricants can ultimately mean warpage, misalignment and damaged engine parts.

DIRECTORS ABOLISHED (from page 1)

Captain General, Colonel of the Regiment or Colonel Commandant on matters related to their duties; (CAOs 20-25 and 20-28 refer);

Maintain liaison with the Corps Representative at CFHQ;

Maintain liaison with the corps association and regular and militia units and, foster relations between the regular and militia units of the corps;

Keep in touch with allied corps;

Advise on matters of dress and customs;

Be responsible for non-public corps funds and property, including museums;

Be responsible for corps publications including the corps history and liaison letters;

Be responsible for corps charities, organizations (including corps committees), memorials and competitions;

Maintain representation and liaison with professional organizations which are of interest to the corps.

***

CFHQ Corps Representative will be responsible for:

Advice on selection of the corps school commander;

Advice on selection of officers to fill corps positions;

Advice on the employment or careers of corps officers when in the interests of the officer or the corps in general, including attendance at the annual review of officers;

Advice on enrolment standards for officers both CA(R) and CA(M);

Advice on plans for secondment, postgraduate training, extra regimental employment, and technical employment and training for officers of his Corps.

Advice on selection of warrant officers for promotion to warrant officer class 1 and on their appointments;

Advice on selection of warrant officers and non-commissioned officers for classified and specialist commissions;

Advice on the priority of allotment to trades for the award of group 3 and group 4 pay. (AGI No. 64/4 dated 17 Jul 64 refers);

Advice on employment and careers of all other ranks when in the interest of a member or the corps in general;

Advice on enrolment standards for other ranks both CA(R) and CA(M).

RCEME School

New terms of reference are given for army training establishments including RCEME School. The most noteworthy change in this regard is that "Communications between CFHQ and Corps Schools on all training and personnel matters will be through the CP Branch except for advice or support required by C Op R Branch on the functions detailed in serials 67 to 81 of Appendix 1." (P1901-0080/00 (DGSA) dated 16 Nov 64.)

These functions, generally, are: User trials, preparation of training manuals, training precis, training standards and trade specifications, and technical publications.

SUGGESTIONS RECEIVED

The following suggestions have been submitted by military or civilian personnel in the Corps. Some will be adopted and many will be 'shot down' for various reasons. However, they are the best evidence that RCEME people are constantly using their heads.

These files were received in DEME during the period November to January. The publication of the particulars here does not in any way imply their acceptability.

Suggestor	Suggestion
Mr J van Zeeventer 215 Wksp	Bolt extractor for Centurion
S sgt G Meisner 14 Coy	Method of establishing parallelism between gun and sight
Mr M Joannette 202 B/W/Shop	Modification to Meteor engine electrical harness
Mr PH Plamondon 203 Wksp	Cushion connector for generator set
Mr WEM Allender 27 COD Wksp Br	New grease for starter motor
S sgt HN Irvine 1 Fd Wksp	Coil spring compressor for Ferret
L/sgt R Danahy 202 B/W/Shop	Modification to cutout relay

SPANNER SPEAKS

Everybody at 4 Field Workshop has been kept pretty busy the last few weeks. Among the many projects that have been on the go recently are the engine change program on all the Brigade helicopters, the training of the army's new Armoured Personnel Carrier M113A1, and the modification of the Ferret wheel hubs.

The wheel hub program involved all the Ferret scout cars in the brigade. It was a major program involving the resources of the vehicle platoon and the Canadian Detachment at 23 Base Workshop (BR) at Wetter. Started on 14 Oct, the program is now nearing completion. Considerable work was involved in the modification of all four wheel hubs on each Ferret to prevent accidental loss of the wheel. The whole program was carried out with no more than 8 cars off the road at any one time, at least for this modification. Those who worked hard to make this program a success were Ssgt Mombourquette, Cfn Card, Egglefield, Barko, Bienvenue, Huber, and honourable mention to Cpl Arnold Adrian, a late comer to the section.

Last week a familiarization course on NAVAID and infrared equipment for electrical technicians was held in electrical section. The aim of the course was to train technicians attached to the user units and 4 Fd Wksp to carry out unit repairs on these equipments.

The NAVAID is a device mounted in a vehicle to permit navigation by automatically computing the position of the vehicle on the ground. The infrared equipment is an aid to visual observation at night.

Those attending the course were, Cfn HW Kaczkofsky, Cpl SR Jackson, Cpl WAJ Thorburn, Cpl RA High, Cfn MD Cosman, Cfn DB Whalen, Cpl EG Paisley. On the last day of the course the instructor, Ssgt Jack Atkins, took the students on a position finding exercise using a NAVAID mounted in a jeep. We are glad to report that all managed to find their way back.

On Saturday, Nov 21, a party for the aircraft fraternity of the Brigade was held in the Red Patch Club. Host for the occasion was Aircraft Platoon. Music was provided by the "Canadian Airs" featuring Aircraft Platoon's Cpl George Haines on rythm guitar. Doing a fine job as "MC" was Cfn MacLean, an old displaced or misplaced Cape Bretoner. These recent arrivals from Canada were introduced: Ssgt Roy Currie, Cpl Bychuk, MacPherson, O'Brien, Cfn Soulis, Nault, Pattern, Arvidson and the new OC of Aircraft Platoon, Capt FG Hutson. Everyone agreed it was a really good party and now the search is on for any excuse to have another just like it.

-The Beaver

---

33 TECHNICAL SQUADRON, SUDBURY

At the last training conference for 16 Militia Group held in Sudbury, Group Commander, Brigadier JF Westhead, MBE, ED, presented to Major LM Ramsey, CD, and to Captain AH Closs, CD, Training Officer of 33 Tech Sqn RCEME, two awards won by the Squadron during the past year. The awards were the RCEME Rifle Shooting Competition and RCEME Tradesmen Competition for Central Command.

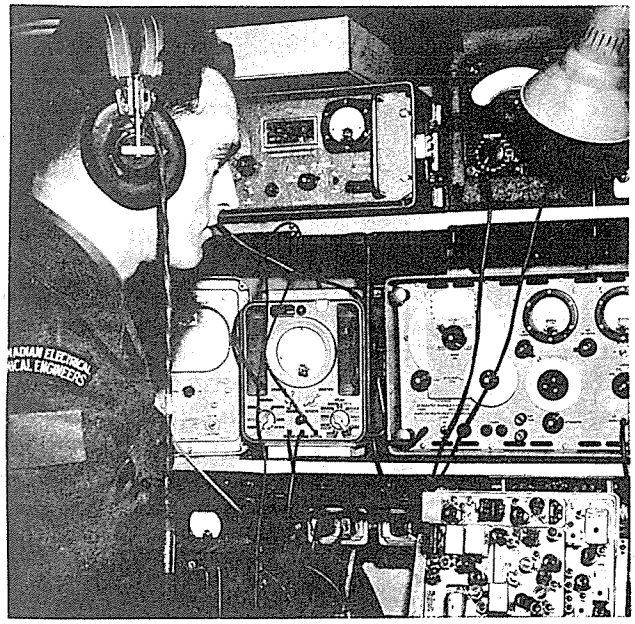
The awards add to a long list of awards won by this Squadron over the years for its high standards of training and efficiency.

Our picture shows Major Ramsey and Captain Closs receiving the awards from Brigadier Westhead, and Lt-Col ES Wooton, CD, of Group Headquarters.

NEW BOOKLET

Pre-Group 4 Assessment

A new booklet outlining the standards for this year's pre-group 4 assessment has been published. The colour of the booklet is blue, so disregard the green booklet. There are many changes in this new booklet, and all sergeants and substantive corporals in applicable trades should read it as soon as possible.



THEY'VE COME A LONG WAY SINCE SEMAPHORE – Muses Cfn GA Bruce of 4 Fd Wksp as he checks out a C 42 set.
(PR Photo)

SPANNER SPEAK - AGAIN

The first Ferret scout car to be modified with 30 calibre machine gun mounts has just been completed by Weapons and Electronics Platoon. It will permit the machine gun to be mounted pointing forward or to the rear. A program to modify all the remaining Ferrets in the brigade is now being drawn up. Hard working members of Small Arms Section who worked on the first installation are Ssgt CH Waugh, Sgt R Switzer, Cpl JAG Townsend and Cfn J Forbes.

Last week when honours for hard work on the Ferret wheel program were given out, L/Cpl LL Allen was inadvertantly missed. Since L/Cpl Allen was one of the originals assigned to the project, our apologies for missing his name.

Congratulations are in order for Sgt Frank Rice who bowled a 415 on Sunday night. Only a spare in the third frame prevented a perfect game. He also came up with a high triple of 840. Guess the Fort Chambly Bowling Alleys are not so bad after all!

-The Beaver

Jaguar Bill raced up the hill,
His speed was 83;
At 104, intent on more,
The turn he did not see.
His drop through the air
Was the root of the square
Of the length of his climb
To the edge,
Less the square of the base,
From the start of his race
To the point where
The crew had to dredge.

I got this mathematical nursery rhyme from Dover Publication called "Ingenious Mathematical Problems and Methods".

- Major DH Curling

Ssgt GR Hein (left) and Sgt RE Willard, conduct operational tests on HIAB Speed Loader at the RCEME School.
- Photo by Thomas